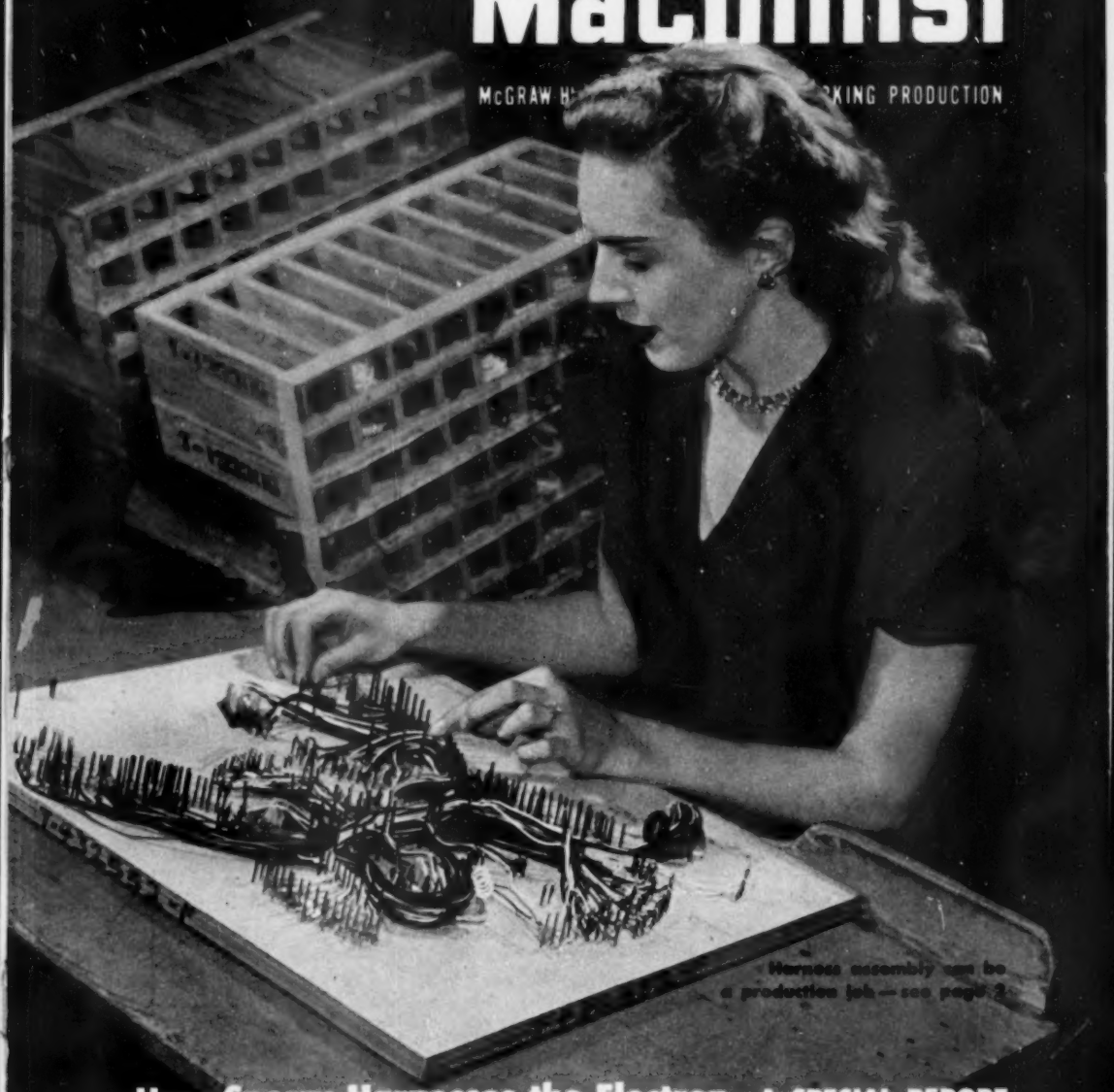
PRICE 50 CENTS

American Machinist

APRIL 14, 1952

McGRAW H[illegible] [illegible]KING PRODUCTION



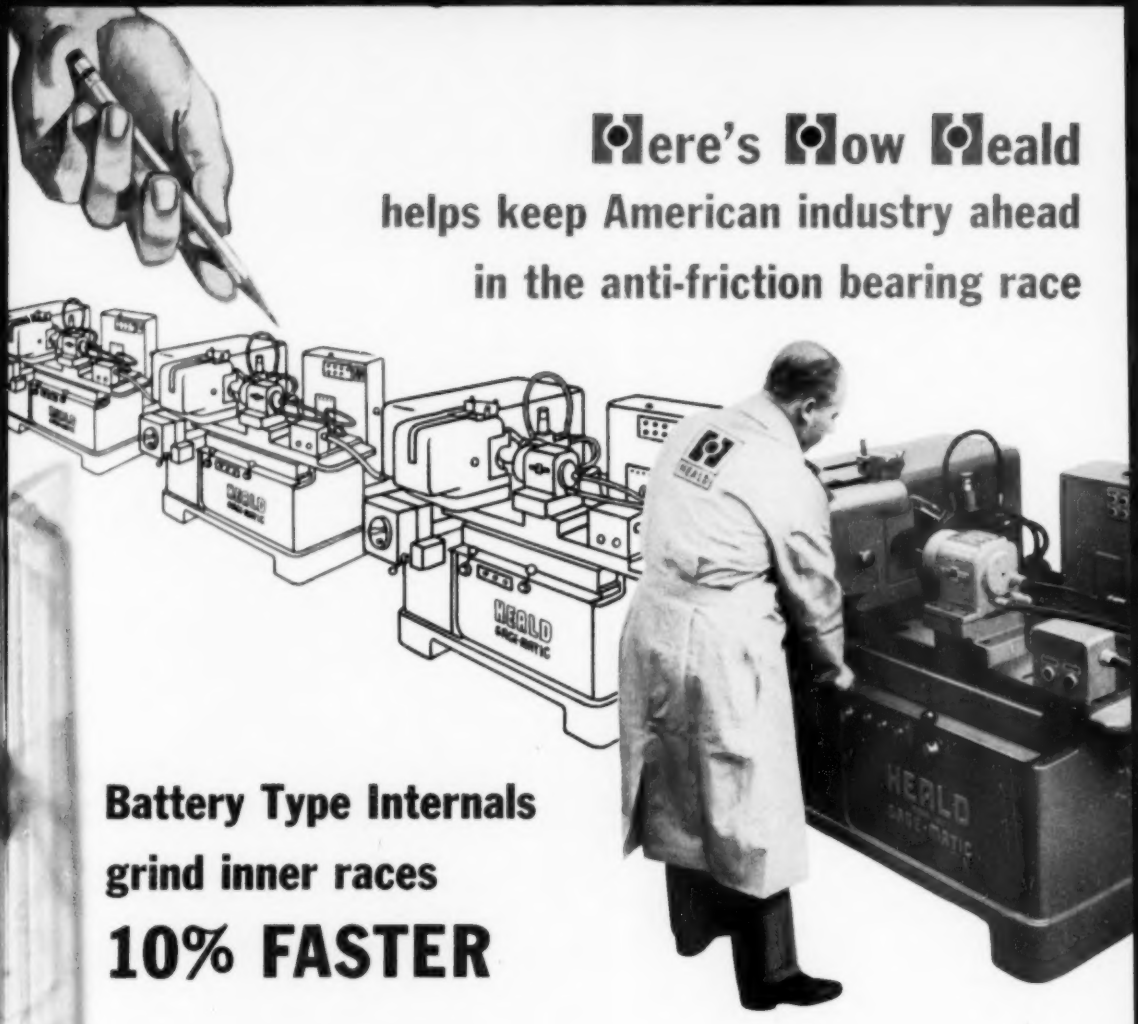
Harness assembly can be a production job—see page 2

How Sperry Harnesses the Electron—A SPECIAL REPORT

How to Estimate Hobbing Time

Here's How Heald

helps keep American industry ahead in the anti-friction bearing race



Battery Type Internals grind inner races

10% FASTER

Ten per cent may not seem like much. But in anti-friction bearing production, it's a pretty substantial increase. For these parts are turned out by the millions — and seconds saved per part mean hundreds of extra bearings per day. What's more, this increase is in comparison to previous production on high speed automatic machines. The savings therefore directly reflect the advantages of a Heald Battery Type installation.

Within certain limitations, any reasonable number of battery type centerless internals can be used, depending on production requirements. The important thing is that these Heald machines are specially designed for operation from a central hydraulic power unit, central coolant supply, and central hi-frequency electric power source where applicable. Machines are smaller, permitting a more compact group assembly. Controls are designed for easier operation. And because they are *fully automatic*, several machines can easily be tended by one operator. That means important savings in manpower, as well as in initial investment, maintenance and operating costs. Remember—when it comes to precision finishing, it pays to come to Heald.

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Heald machines speed the nation's production

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CONTENTS for APRIL 14, 1952

VOL. 96, No. 8

ADMINISTRATION
Editorial ..... *Burnham Finney* 125
Play Ball ..... *Round Table* 165

SPECIAL REPORT
How Sperry Harnesses the Electron ..... *E. J. Tangerman* 143
Rules Don't Fit Retirement ..... *R. E. Cochran* 159

ASSEMBLY
Peroxide Tanks Pose Welding Problems ..... *W. F. Shefeton* 173
Copper Strips Spotweld Stainless ..... *R. G. Vare* 176

ENGINEERING
How to Estimate Hobbing Time ..... *S. J. Johnson & P. R. Noling* 127
One Basic Card Controls All Tools ..... *W. Hubbes* 170
We Buy Tools from Past Performance ..... *John M. Finally* 174
Cost of Grinding Carbide ..... *H. W. Wagner (RBS)* 183
Bolt-Steel Classification ..... *(RBS)* 185

HEAT-TREATING
This Furnace Processes These Parts 139
Screw-Thread Decarburization Limits ..... *(RBS)* 187

INSPECTION
X-Ray Perfect ..... *David Goodman* 155
Recording Voltmeter Checks Weld Quality ..... *George A. Hatfield* 158

MATERIAL CUTTING, FORMING
How Ford Plans for Low-Cost Chip Handling ..... *Miles J. Rowan* 134
Broaching Makes an Anchor ..... *Joseph A. Psenka* 140
How Wing Skins for B-47s Are Taper-Milled ..... *Jerry Sanford* 166

TOOLING
Diemakers Kinks ..... *Federico Strasser* 131
Talented Tooling 132
Hinged Work Loaders Save Grinder Centers ..... *Tom Brown* 176
Inclined Jack Pin Registers Press Stock ..... *Donald Zuerl* 176
Whistle Grip Extends Drill ..... *P. Lawson* 176
Taper Indicator Added to Tailstock ..... *Olin C. Brage* 177
Shims Enlarge Hole Tools ..... *Rudy Martinka* 177
Straightening Wire ..... *Haim Murro* 177
Bridged Templet Guides Radius-Cutting Planer ..... *Ralph J. Rossi* 177
Ring Chucker Centers Automatically ..... *W. M. Halliday* 178
Faceplate Stops Speed Boring Work ..... *Lauri Ayala* 178
Coil-Winder Speed Nut Has Lever Control ..... *William Richter* 178
Old Micrometer Makes Height Gage ..... *P. Opanowicz* 179
Boring-Bar Hole Gage Centers Automatically ..... *A. Vetsch* 179
Universal Clamp Adjusts for Any Height ..... *Hjalmar Dahl* 179
Scribing Circles on Castings ..... *Lester J. Pech* 180
Checking Steadyrest Setups ..... *Tom Brown* 180

NEWS OF METALWORKING
Spot News 111
Washington 113
Detroit 115
Machine Tools 117
Gaging Metalworking 121
Name in the News 196

DEPARTMENTS
Backlash 104
Reference Book Sheets 183
Talking Shop 189
Equipment, Materials, Parts .. 198
Round Table Discussion 226
New Books 278
Subcontracting News 239

AMERICAN MACHINIST, published bi-weekly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder.

EXECUTIVE EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerard, Vice President, Treasurer; John J. Cuddy, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice President, Director of Advertising; J. E. Blackburn Jr., Vice President, Director of Circulation.

SUBSCRIPTIONS: Address correspondence to American Machinist-Subscription Service, 330 West 42nd Street, New York 36, N. Y. Allow ten days for change of address. Please indicate position and company connection on all subscription orders.

Single copies, 50c. Subscription Rates—United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada $7 for one year, $11 for two years, $14 for three years. Pan-American countries, $15 for one year, $25 for two years, $30 for three years. All other countries $25 for one year, $40 for two years, $50 for three years. Entered as second-class matter, August 18, 1945, at Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U.S.A. Copyright 1952 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved.

Chips

Harness . . . Several times readers have asked, "How is a harness made?" Well, the cover shows how Sperry Gyro makes it—wires precut and prepared, even partly preassembled. Special table with tilting top holds the harness board, special racks hold wires, and so on—but don't stop with the front cover in color (attractive as she is). The whole story on the tricks that have tremendously speeded harness-making at Sperry is in a 12-part Special Report in this issue. There are other ideas there, too, about special benches, lighting, seating, outlets, and planning. You'll find there's very competent manufacturing practice behind that familiar electronic-engineering name—Sperry.

Hobbing . . . We've had questions, too, from time to time about how to figure hob overrun and such-like. So we asked Barber-Colman about it. S J Johnson and P R Noling collaborated on our current lead article, "How to Estimate Hobbing Time." It gives the factors involved in hobbing and how to calculate total carriage travel (including approach and overrun) to determine total time per gear.

X-ray . . . Some time ago, we mentioned to Dave Goodman that industrial x-ray labs and the work they can do might be a useful article. As a consequence, he's put a story together that surveys the uses of x-ray, and shows how it can save you money in inspection. . . . Then, for contrast, G A Hatfield of National Supply Co describes an unusual method of keeping tabs on the quality of submerged-arc welds. It's done by inspecting readings on a recording voltmeter—and has substantially reduced the number of x-rays required on jobs where it has been applied. . . . Just goes to show it's a small world.

Low-Cost Chip Handling . . . More and more companies are becoming conscious of the cost of chip handling. Ford, at the new Cleveland Engine Plant, made several departures from conventional thinking in preparing to handle dry CI chips, steel chips mixed with soluble oil, and grinding sludges, and in purification of coolant. For example, coolant isn't filtered on some steel jobs; oscillating conveyors are standard; in some cases, base castings on machine tools were changed to admit conveyors. Although the plant is huge, most of the systems are a series of small installations that could be applied anywhere. So Associate Editor Rowan describes them for you.

Fire . . . The fire after the second day of the Tool Show in Chicago brought out the usual ingenuity. To begin with, loads of sawdust absorbed water, soot, and general debris, and a broom squad cleaned up all night so the show could open on schedule. Then exhibitors salvaged some equipment, had special signs lettered about the fire, reproduced display elements. Harvester got duplicate quality-control exhibits within 24 hr, Taft-Peirce showed a 4x6-ft blowup picture of what its booth had been, Eastman Kodak men talked from 8x10-in. photos of the equipment destroyed.

Anchor . . . J A Psenka of National Broach has pictured in considerable detail the broaches and fixtures that make an automobile-transmission part. . . . Again automotive is a single-page yarn on use of the Ipsen controlled-atmosphere furnace for clear-hardening various clutch parts 2½ times faster than liquid cyaniding. It also reduces operations and holds the case depths accurately for Rockford Clutch Co.

Coming . . . April 28 *AM* will include a Special Report on equipment for plastic molding, plus articles on working titanium, on machining green compacts, on tooling operations, on dies, on a special slotting fixture, and on strip broaching. There'll be a cover picturing gang-milling, too.

THOUSANDS OF SMALL CONIFLEX® GEARS ARE CUT DAILY
With the new Gleason No. 2 Straight Bevel Generator thousands of small size straight bevels with localized tooth bearing are cut daily. The latest development in the cutting of small Coniflex® gears uses interlocking-type cutters which, operating in a single tooth space, complete each space from the solid metal in one operation.
It is ideally suited to the manufacture of Coniflex® gears to be used in such applications as typewriters, business machines, instruments, ordnance equipment, hand tools and many others.
When high productivity is the object, a fast, reliable automatic loader is available for this machine.
Write for leaflet describing how this modern, high speed, completely automatic machine can produce small Coniflex® gears for you.
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GLEASON
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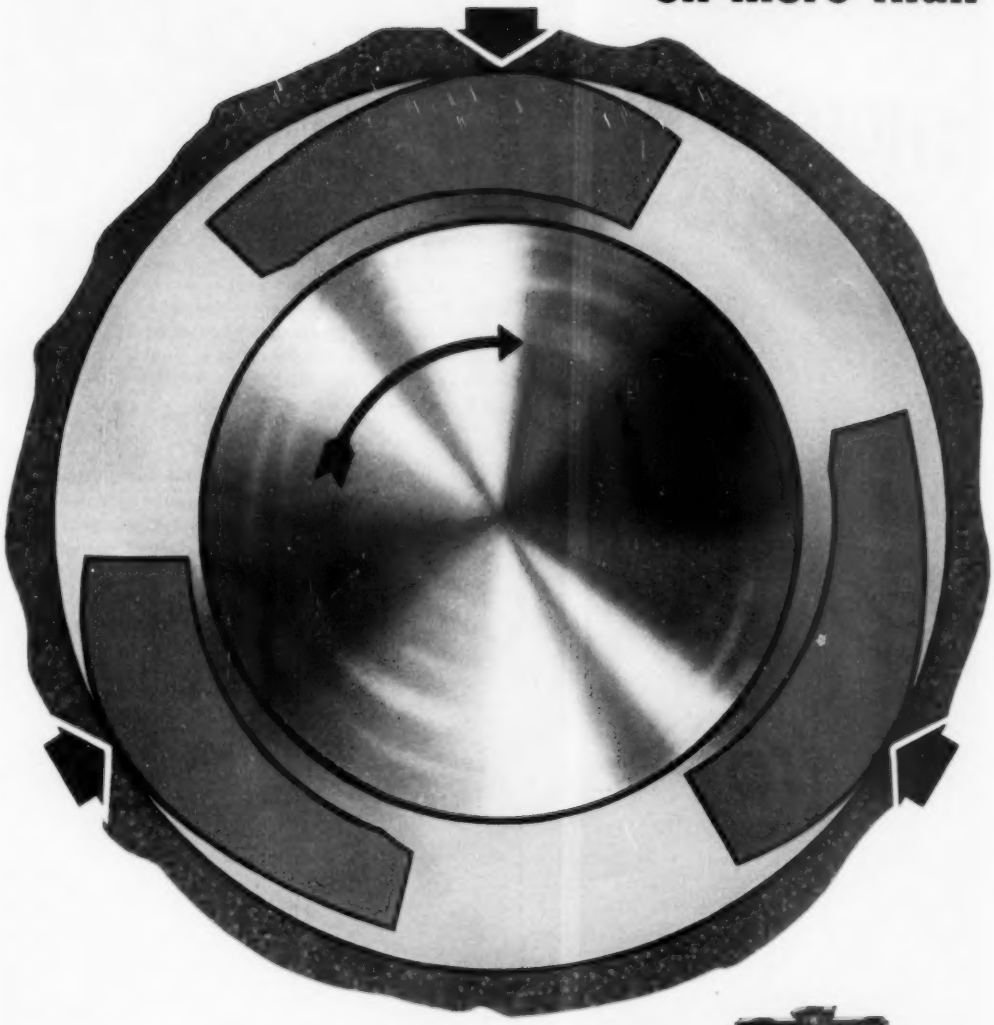
Not one cent

on more than



CINCINNATI

In this drawing of the FILMATIC principle, the dimensions and clearances are greatly exaggerated. During rotation, high pressure oil wedges support and automatically centralize the spindle—*no adjustment required*. The spindle drive motor cannot start until the bearing compartment is full of clean, filtered oil. No chance for wear. Write for booklet G-578-1.

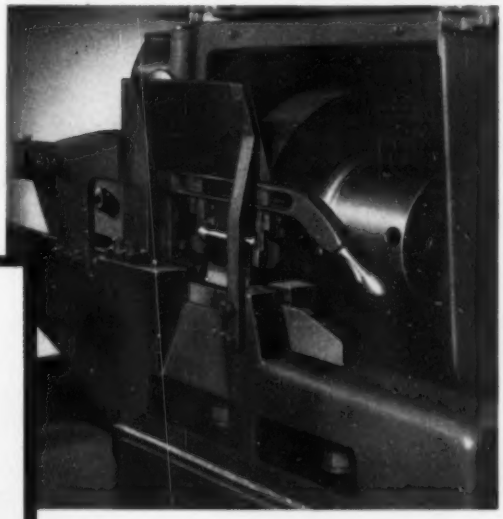
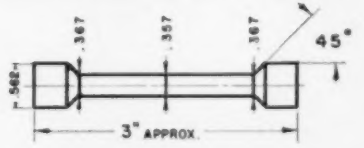
CINCIN

spent for maintenance 99% of FILMATIC SPINDLE BEARINGS

Here's a historical fact that can mean a brighter future for machine shops everywhere. About fifteen years ago CINCINNATI Grinders were first equipped with FILMATIC grinding wheel spindle bearings. During the intervening years, new model CINCINNATI Grinding Machines have been introduced, and many improvements have been made in others. However, the feature which has given the greatest benefit—FILMATIC—has been retained. During these long hard years, over 99% of all FILMATIC bearings—thousands of them—never have required time off for any reason whatever. ¶ In addition to their dependable performance, you don't have to pamper FILMATIC bearings. CINCINNATI FILMATIC Grinding Machines take quick roughing or high-quality finish cuts without adjusting the bearings. Spark-out is quicker. No "pecking" of the diamond while truing. ¶ FILMATIC'S perpetual youth, found only in CINCINNATI Grinding Machines, can save time and money in your shop. Specify a CINCINNATI FILMATIC for your next precision grinder. To obtain brief descriptions, write for general catalog No. M-1712.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

All CINCINNATI Grinding Machines and CINCINNATI Centerless Lapping Machines are equipped with FILMATIC grinding wheel spindle bearings

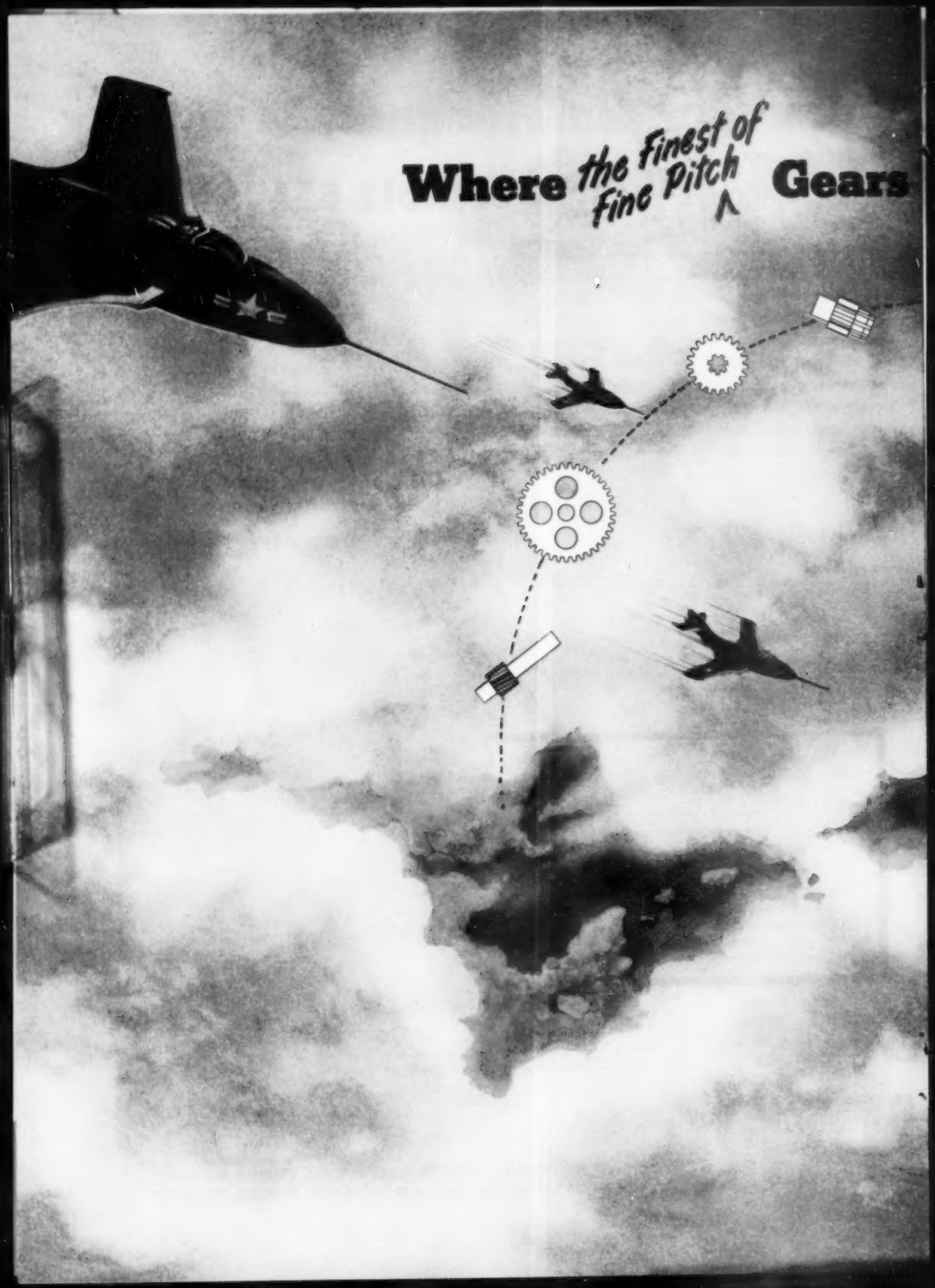


Imagine trying to remove so much metal—.205" diameter reduction in one cut—without the benefit of FILMATIC grinding wheel spindle bearings. This is a sketch of a tensile test part being ground on the setup at the right, where the grinding wheel has been removed for better visibility.

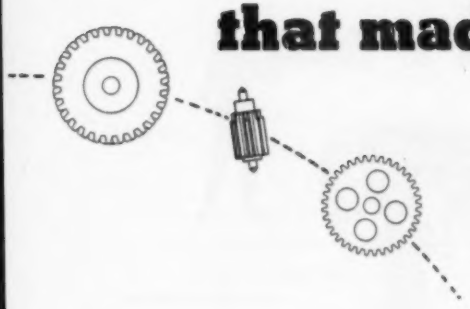
Would you like to know more about zero-maintenance FILMATIC spindle bearings? Write for booklet No. G-578-1.

NATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES


Where the Finest of Fine Pitch Gears

justify the Machine-Skill that made them



Gear trains designed to perform super-precision control functions in the stratosphere are no ordinary product. Neither are the methods and machines by which they are turned out—in quantity.

The Fellows 3-inch Gear Shapers and Fellows Shaving Machines, on which the great majority of such gears are made, are standard machines—maintained in fine adjustment by men of industry, men whose production-shop skill is unmatched anywhere else in the world.

That we have the tools, the talent, and the engineering imagination to make maximum use of them is America's fundamental strong defense.

If you have a fine-pitch gear production problem—to normal or extra-close limits—let a Fellows Sales Engineer give you a close-up look at the cost-cutting possibilities of Fellows 3-inch Gear Shaper and No. 4 Fine Pitch Gear Shaving Machine.

Fellows No. 4 Fine-Pitch Gear Shaving Machine means super-accuracy of fine-pitch gears.

The Fellows 3-inch Fine-Pitch Gear Shaper will handle work as small as 1/16" pitch diameter, and as fine as 120 pitch. Magazine loading devices are available.

Fellows

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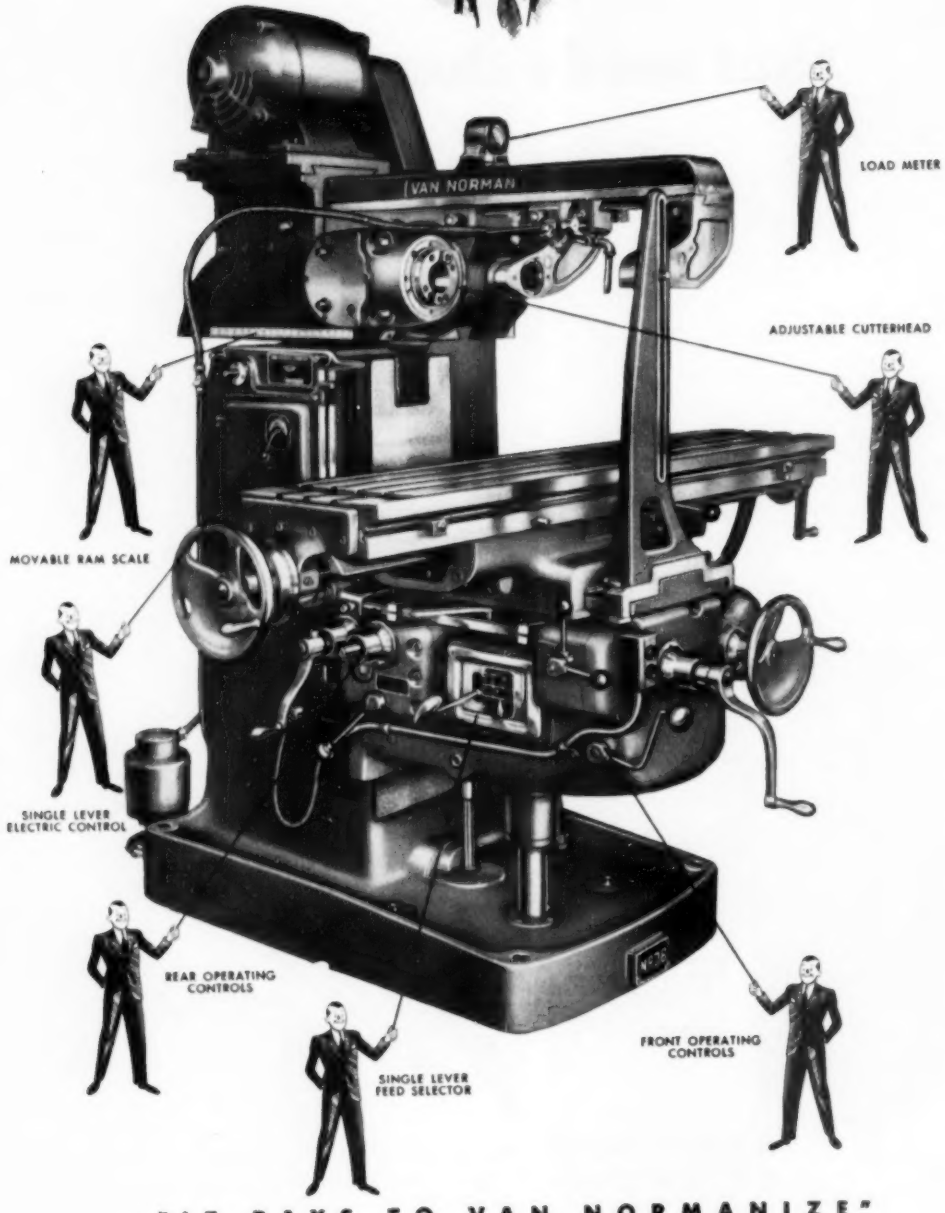
Look at the



"IT PAYS TO VAN NORMANIZE"

Production Advantages of the

VAN NORMAN

RAM TYPE MILLER

Regardless of the type of plant or the type of work, Van Norman Ram Type Millers can cut your milling costs and speed vital production. These versatile millers reduce idle machine time by as much as 50% because they enable the operator to perform conventional horizontal, vertical and angular milling on *one* machine. Look at what Van Norman Ram Type Millers can do for you —

Adjustable Cutterhead

By merely positioning the cutter head, the operator can perform horizontal, vertical or angular milling . . . the work of three single-purpose machines.

Increased Work Range

Movable ram plus the saddle crossfeed increase the work range and capacity of the miller . . . enable you to handle larger work pieces with ease.

Front and Rear Controls

Operating controls are located at front and rear for ease of operation. They eliminate back and forth operator motion . . . reduce operator fatigue.

Simplified Electric Control

Built-in electric controls simplify operation. Single lever selector controls spindle, feed, and coolant. Push button, on front of knee, starts and stops motors as pre-selected.

Load Meter

Built-in load meter indicates percent of load at which the cutter is operating. It enables the operator to operate miller at maximum efficiency . . . helps to prevent overloading of the miller motor.

Any way you look at it, the Van Norman No. 38 Ram Type Miller is your best buy for cutting costs, increasing production and accuracy.

Van Norman Ram Type Millers are available from 37" to 64" table lengths.

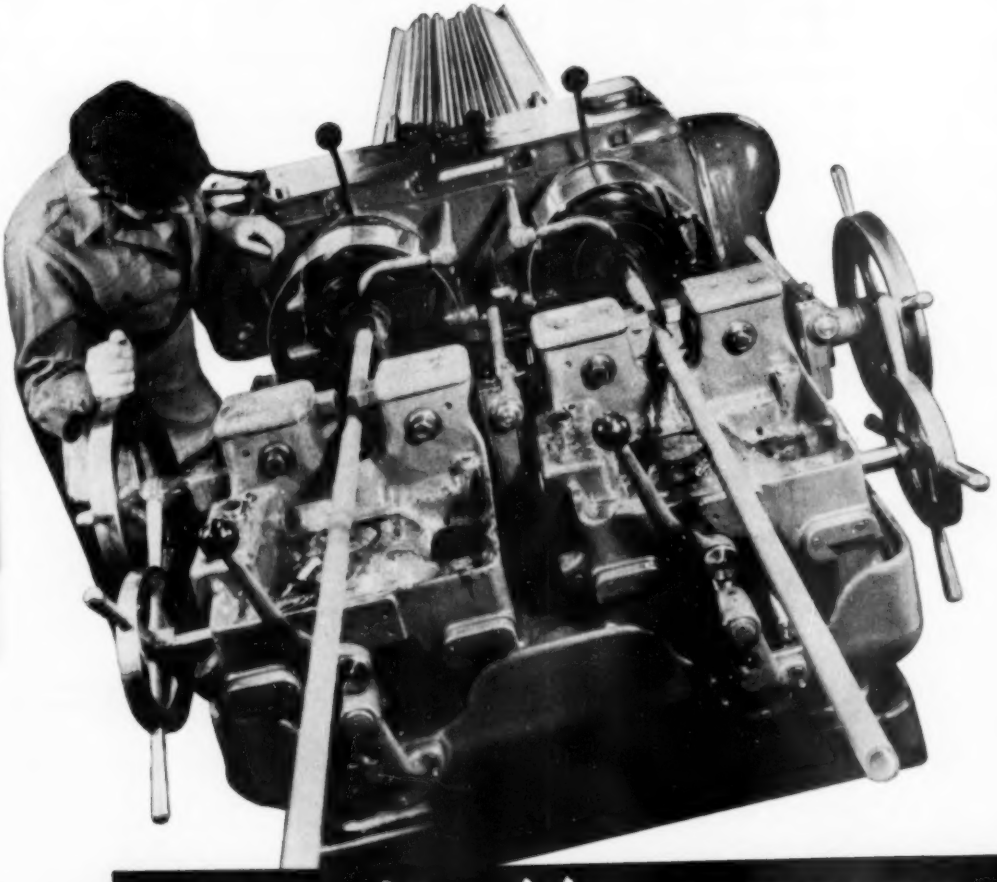
Write for complete information, today.

VAN NORMAN COMPANY

Springfield 7, Massachusetts

PRECIS

. . . threads cut



LANDIS *Machine* COMPANY

ION *plus*

to Class 7 tolerances

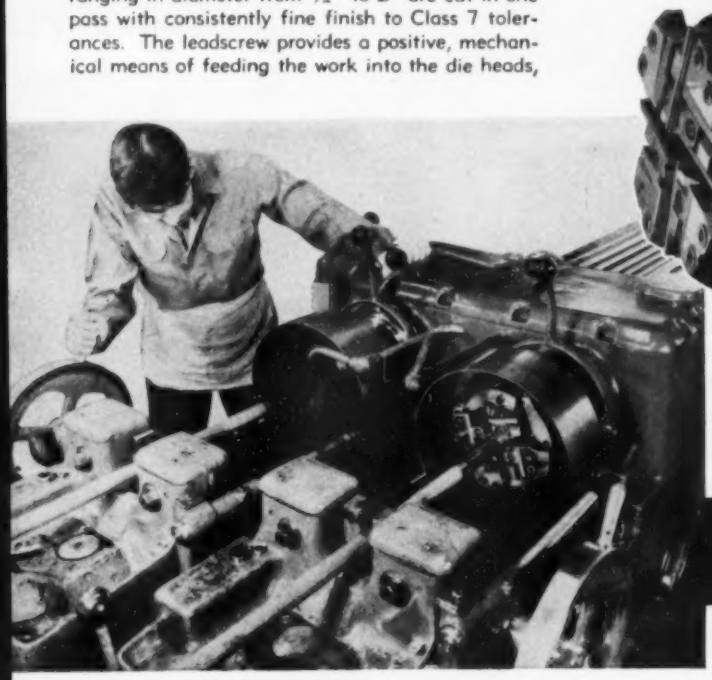
Continuous threads cut on studs must meet exacting requirements to withstand the high pressures and temperatures to which pressure vessels, steel pipe flanges, fittings, and valves are subjected.

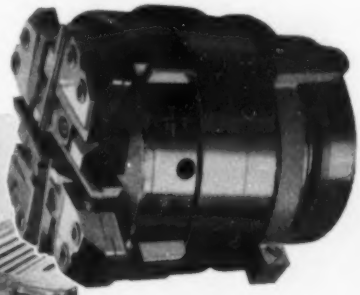
At the R.E.C. Corporation, New Rochelle, N.Y., continuous 1⅜" 8P threads are cut to within pitch diameter limits of .002 on 12-foot heat-treated bar stock of 269 to 311 Brinell hardness. The fully threaded bars are then cut into the desired stud lengths.

By using Double Head LANDMACO Leadscrew Threading Machines equipped with Hardened and Ground 2" LANCO VV Heads, threads ranging in diameter from ½" to 2" are cut in one pass with consistently fine finish to Class 7 tolerances. The leadscrew provides a positive, mechanical means of feeding the work into the die heads, thus assuring the maintenance of close lead tolerances.

Even on this precision threading operation, net production is good, averaging 36 linear feet per hour at a cutting speed of 25 surface feet per minute. An average of 108 linear feet of threads is cut between chaser regrindings, resulting in low tool cost and minimum down time.

Having given many similar outstanding performances in other fields, LANDMACO Machines can help to cut costs, step up output, and improve finish and accuracy in your thread production.



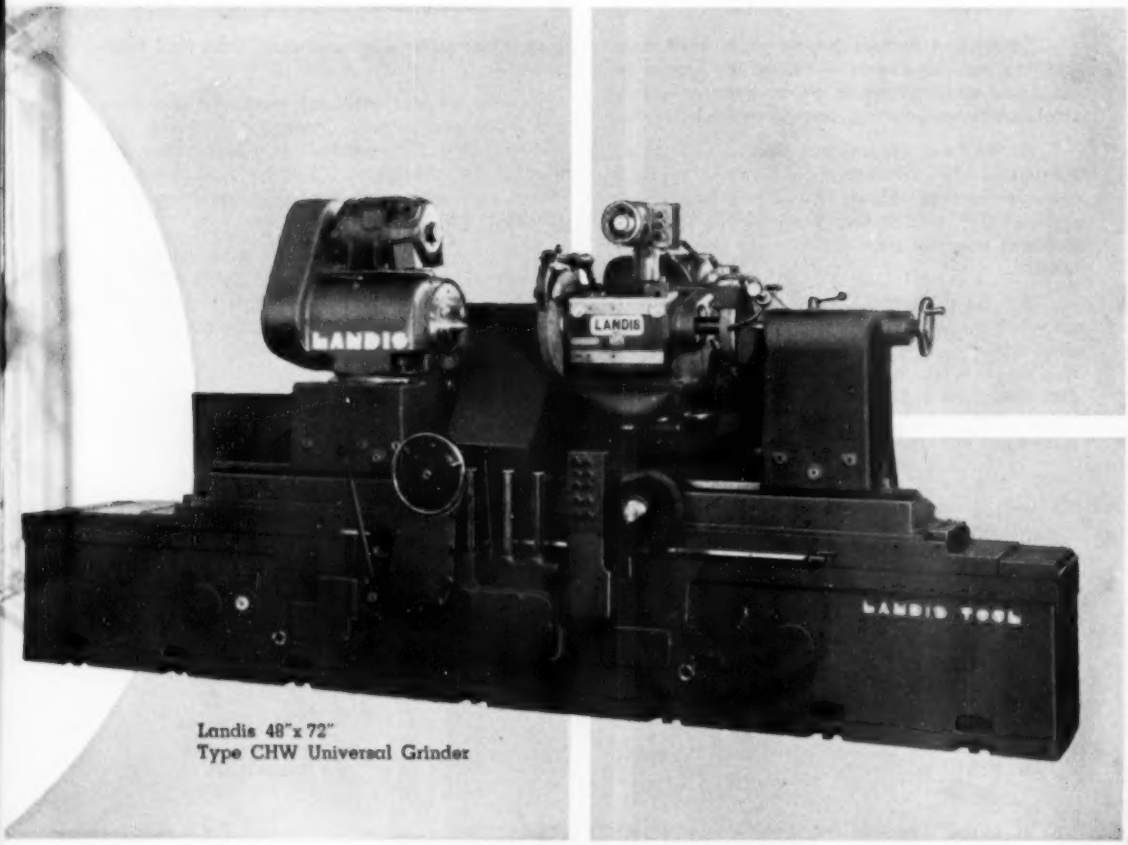


For complete information and specifications, write for Bulletin H-75.

WAYNESBORO PENNA., U. S. A.

New Landis Development for

Maintenance problems solved with new type CHW Universal Grinders



Landis 48"x 72"
Type CHW Universal Grinder

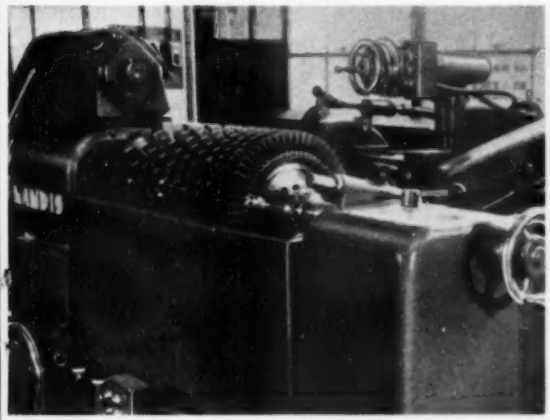
LANDIS
precision grinders

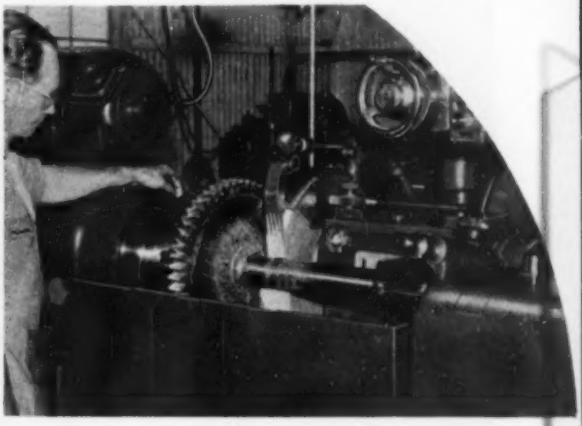
Work swings up to 48" diameter. Length between centers up to 120". If you have a problem grinding large diameter, send us your blueprints for tooling and production estimates.

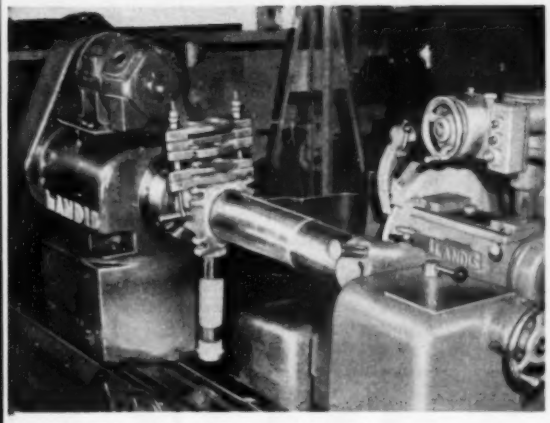
Precision Grinding of Aircraft Parts

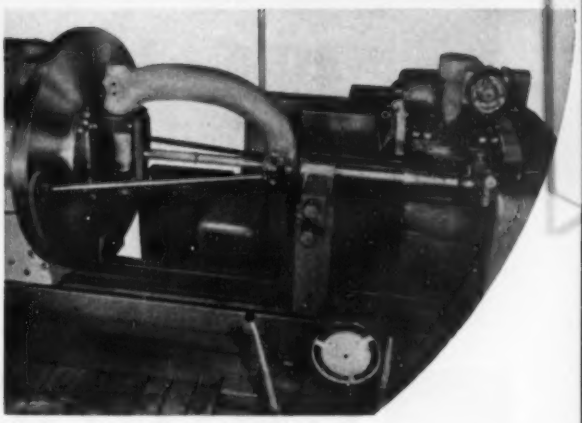
COMPRESSOR ROTOR ASSEMBLY
Grinding tips of replacement blades on compressor rotor assembly. Stock removal .075" on diameter. Work held between centers. Extra wide carriage ways provide stability for heavy stock removal and precision limits.

TURBINE WHEEL AND SHAFT
Maintenance grinding of turbine shaft. Stock removal .012" on diameter, grinding chrome carbon steel. Limits are .0005" on diameter. Operator has excellent view of work and wheel.









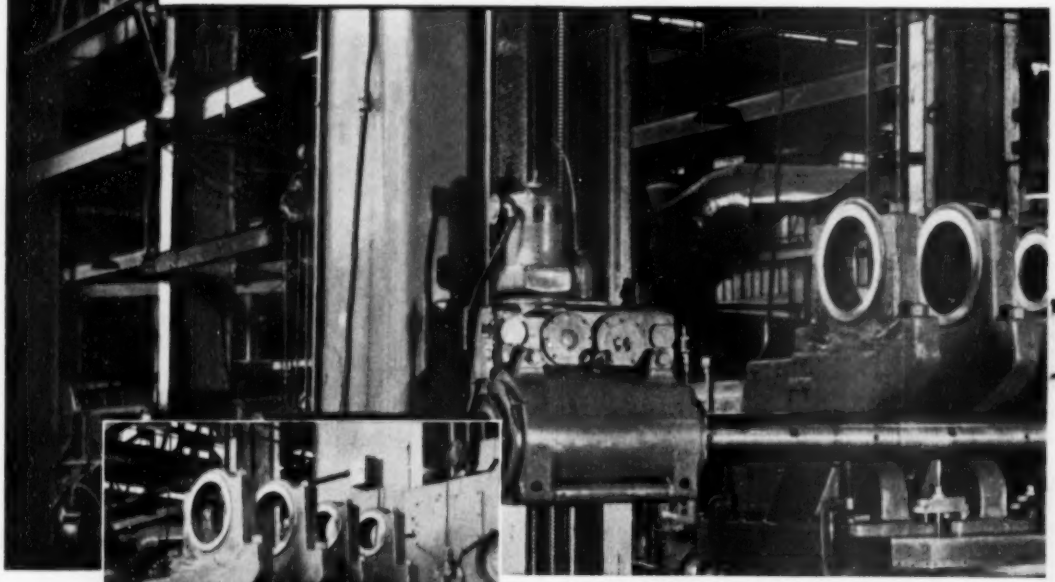
LANDING GEAR INNER CYLINDER
Counter balanced because the weight distribution is unusual. Stock removal is .006" on diameter from chrome plate. Work chucked and driven from live spindle headstock.

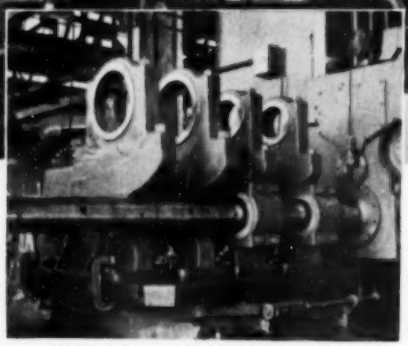
LANDING GEAR FORK AND AXLE ASSEMBLY
Recondition grinding operation with special fixture holding and centering work against face plate. Stock removal is .016" on diameter from chrome plate.

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

Machine time cut from

ON COMPLEX TROUGH STAND FOR



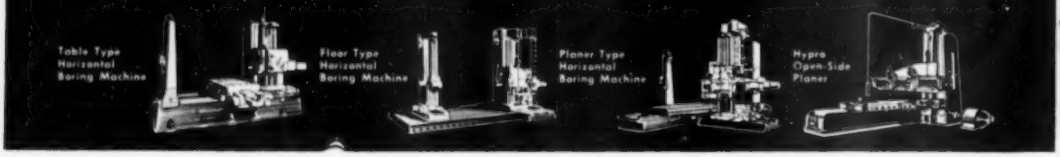


Close-up of finish boring operation on bearing seats. Note rotary table used to rotate workpieces—reduce setups.

Photos and job data — Courtesy Baker-Perkins Co., Saginaw, Mich.

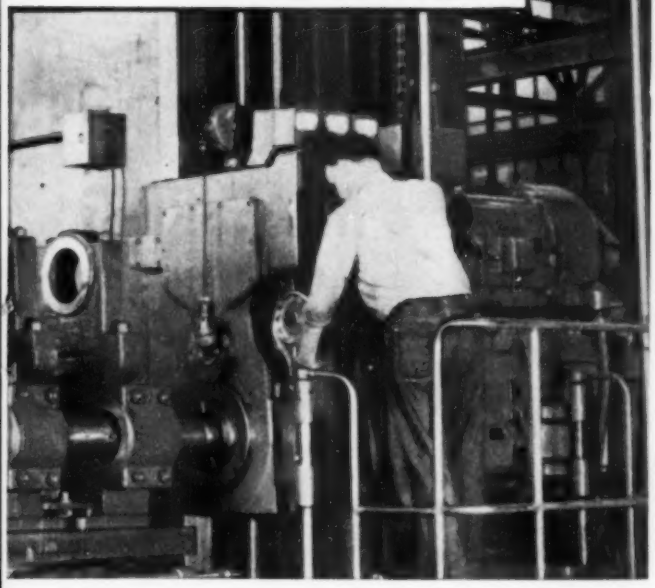
The former time for this job was 24 hours. Then a G&L Job Analysis was made. Result — a 560-T (6" Table Type) G&L Horizontal Boring, Drilling and Milling machine was recommended — together with a G&L rotary table. Now the user sets up workpieces two at a time — and using only three setups completes 4 parts and completes the job in 12 hours . . . at 50% savings in time alone!

GIDDINGS & LEWIS



24 to 12 hrs

CHEMICAL MIXER



You'll find that regardless of the part or parts . . . big or little — simple or complex, you'll save time and money with the G&L line. Maybe you will want a G&L Horizontal Boring, Drilling and Milling Machine — or a G&L Hypro Planer, Planer-Miller or Vertical Boring Mill . . . but whatever your need, you can be sure that G&L's unbiased Job Analysis Service will give an answer that will mean savings to you. See our nearest representative or write direct. Get the facts about a G&L Job Analysis today — there's no obligation . . . and DELIVERY ON G&L's MACHINES . . . MIGHT BE BETTER THAN YOU THINK!

G&L 5-POINT JOB ANALYSIS

takes the guesswork out of machine tool buying . . works for you and with you to solve big or complex machining problems..increases production . . reduces machining costs

1 **COMPLETE STUDY OF YOUR JOB OR JOBS** — G&L Job Analysis Engineers, working with your engineers, analyze your requirements by: (1) number and size of parts to be produced, (2) number and kind of operations needed, (3) tolerances and finishes required.

2 **DETERMINE MOST EFFICIENT MACHINING METHOD** — Taking into consideration the individual machining requirements of the job, G&L Job Analysis Engineers choose the most efficient machining method. G&L engineers can give an unbiased opinion because G&L builds a complete line of sizes and types of planers, planer-millers, vertical boring and turning mills and horizontal boring, drilling and milling machines . . . plus a complete line of accessories and tooling for these machines.

3 **SELECT THE SIZE, KIND AND TYPE OF MACHINE**—The machining method now determined, G&L Job Analysis Engineers — using your production and work requirements — recommend the exact size, kind and type of machine that will do the job most efficiently.

4 **PLAN YOUR OPERATIONS** — After the selection of the most efficient machine to fit your needs, G&L Job Analysis Engineers plan a sequence of operations that will (1) minimize number of setups and setup time, (2) use modern cutting tools to best advantage, (3) take full advantage of the machine working ranges and capacities, (4) keep operator fatigue to a minimum.

5 **RECOMMEND (AND DESIGN IF NECESSARY) THE TOOLS TO USE** — If conditions warrant, G&L will recommend the standard machine accessories, arrangements and tools you can use to make your equipment more productive—more versatile in application. If special equipment is needed, it will be designed to agreed specifications and made a part of your order.

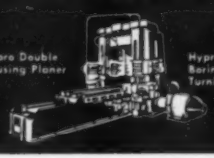
Write, wire or phone G&L or its nearest representative today. Get the facts on your needs — your problems. Get a G&L unbiased Job Analysis to help you. Don't hesitate — there's no obligation . . . AND DELIVERY MAY BE BETTER THAN YOU THINK!

How to get a G&L job analysis

Call your nearest G&L dealer or write us direct. Furnish our Job Analysis Engineers with blueprints, job data, and production requirements. Factory engineers will completely analyze your machining problems. There's no charge, no obligation. Don't hesitate — do it today.

MACHINE TOOL CO.

Hypro Planer Type Milling Machine



Hypro Double Housing Planer

Hypro Vertical Boring and Turning Mill

G&L HYPRO

FOND DU LAC
WISCONSIN

Van Keuren

LARGE AND SMALL MEASURING WIRES

BIG ONES
LITTLE ONES
ANY SIZE
AT ALL

PERFECT cylinders for all measuring purposes,—Threads, Gears, splines, dovetails and angles.

Complete specifications on Van Keuren Measuring Wires, and formulas for their use are given in the Van Keuren 1952 Catalog and Handbook No. 35.

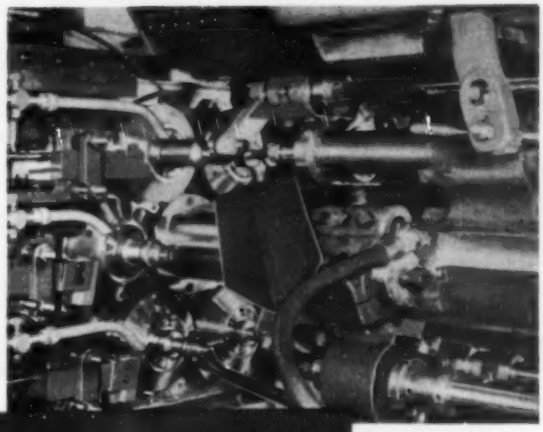
Write for your copy

THE Van Keuren CO.,
33rd YEAR
173 WALTHAM STREET, WATERTOWN, MASS.
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carbalay Cemented Carbide Plug Gages • Carbalay Cemented Carbide Measuring Wires

Case histories have appeal, whether they're about someone's time being bettered at a lathe or at an altar. Success likes success, and "misery likes company."

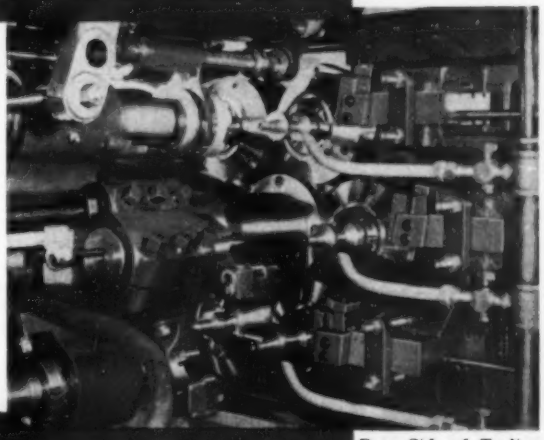
An "automatic's" case history is just an *end* of a *means* of machining facility. If you procure the right facilities, good case histories will result in *your* plant.

When selecting the best multi-spindle automatic facility for *your* needs, you will want to compare *all brands*. But you should have *full* information for a thorough comparison. You can have it on CONOMATICS.

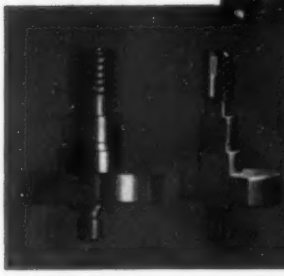


Front Side of Tooling Area 1-5/8-SIX

THE FACILITY BEHIND THE NEWS

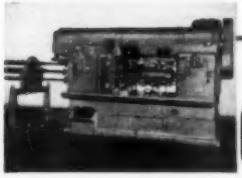


Rear Side of Tooling Area 1-5/8-SIX

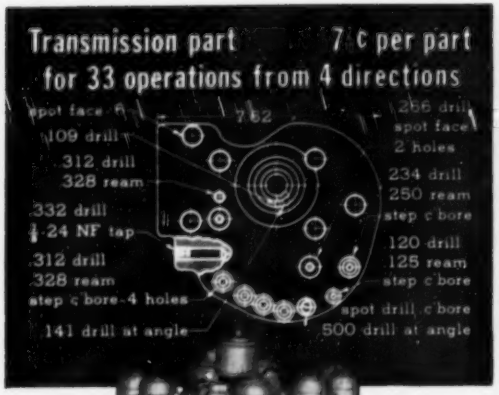


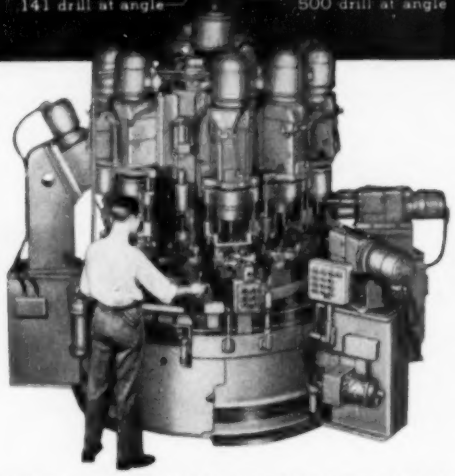
Cross drilling, cross milling, end broaching, end milling, and sawing operations are commonly performed by stopping the work spindles—often a costly procedure. For certain requirements, such as for the broached hole in the piece shown, CONOMATICS have performed all of the operations mentioned without stopping the work spindles.

A Comparison of ALL Automatics is in favor of Cone

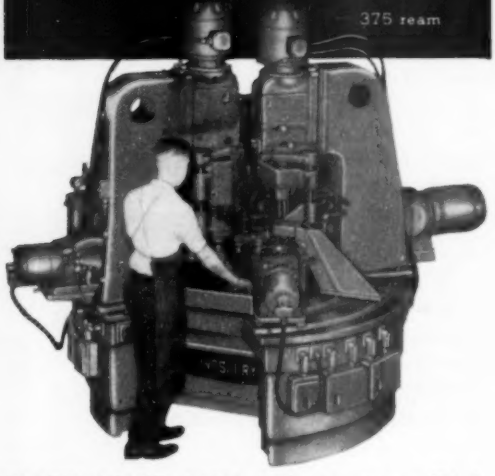


Conomatic CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.





185 PARTS AN HOUR GROSS. This 60-inch power indexing machine has 12 stations. Eight vertical units mounted on the central column operate 28 tools. Two angular units drill .141 and .500. Two horizontal units drill .109 and .332 and tap ⅜-24.



970 PARTS AN HOUR GROSS. Twelve fixtures on a 20-inch power index table rotate 120° with each index. Four horizontal units drill and tap the peripheral holes. Three vertical units do the ten axial holes. Clamping and unclamping are automatic.

Amazingly low unit costs

Any way you figure it, Kingsbury machines save money on accurate high-production drilling and tapping operations

Dear Sir:

Here is the average cost of the man and machine for each *operation* shown in the drawings:

Transmission part	22/100¢
Telephone part	3/100¢
Generator part	7/100¢
Typewriter part	10/100¢

One reason these costs look good is that they include just the man and machine — no power or overhead. But there is no tricky figuring. In fact, we think the basis is quite conservative. We assumed:

1) 80% efficiency;

2) a wage rate equal to today's national average;

3) a pay-off period of 6000 hours of production — about a year with three shifts or three years with one shift, a fraction of the useful life.

The unit cost on each drawing is the sum of these two figures —

The unit cost of the man:

$$\frac{\text{average U. S. hourly wage}}{\text{hourly gross x 80\% efficiency}}$$

The unit cost of the machine:

$$\frac{\text{price of tooled machine}}{\text{output in 6000 hours @ 80\% efficiency}}$$

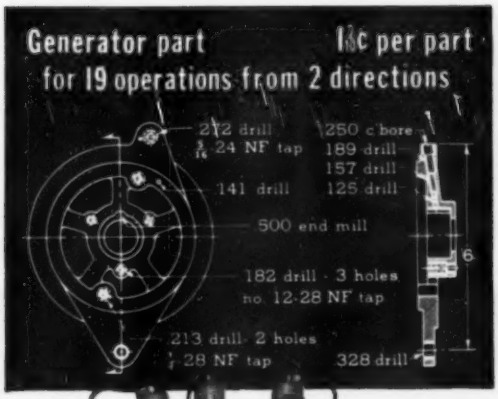
You can use actual figures

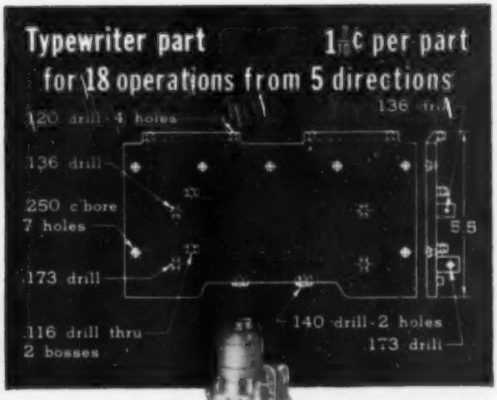
We hold no brief for our assumptions, but we had to assume *something*. The pay-off period is 6000 hours because most Kingsburys do pay for themselves in one to three years.

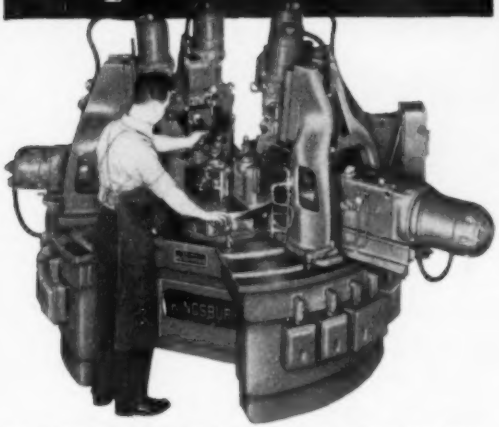
If you want to know if a Kingsbury would be a good investment for you, ask us for a proposal. Then figure your unit costs in your own way using your own figures. Even a rough calculation may convince you.

Meeting close tolerances

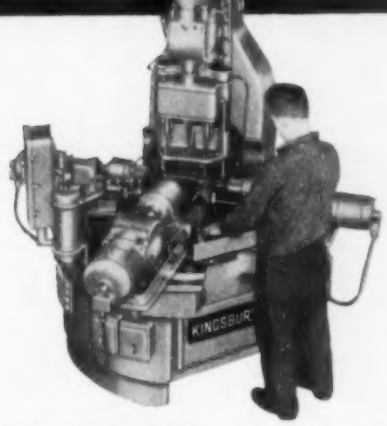
Savings alone don't sell Kingsburys. Other high production machines may match our costs. But how about the quality of the finished parts? In all







430 PARTS AN HOUR GROSS. A 20-inch power index table has five fixtures. At the four working stations four horizontal units do the holes in the left view and four units on tunnel columns do the oil hole. Three units have multi-spindle heads.



280 PARTS AN HOUR GROSS. Put one piece in the fixture and trip a lever. The vertical unit clamps it and counterbores seven holes. Then horizontal units operate on four sides. When the clamp withdraws, remove the piece. There is no indexing.

on 4 high production jobs

humility we feel that in this type of work no equipment excels ours. That is just our opinion, of course, but it is an honest one.

Bushings guide drills and reamers accurately. We locate spindles to exact indicator readings and run them in precision ball bearings.

Each index table and its fixtures are jig-bored to minimum tool room tolerances. Each fixture is rugged and grips the part firmly without distortion. The locating points conform to your specifications.

We're not in the back woods

Some people who visit us for the first time are surprised at the quality of our equipment and our work. Maybe they just don't expect much from people in the New Hampshire hills. Actually we are right between the machine tool centers of Worcester, Mass. and Springfield, Vt.

Our shop has three acres of floor space, 122 machines under ten years old and employs 316 people with a combined length of service of 3257 years. We have 11 jig-borers and nine boring machines, mostly in a windowless air-conditioned building with strict control of temperature and humidity.

If you are ever up in these parts and have high production drilling and tapping problems, we hope you will stop in and see us. We make a lot of friends that way.

Sincerely,

Kingsbury Machine Tool Corp.
95 Laurel St., Keene, N. H.

KINGSBURY
AUTOMATIC DRILLING & TAPPING MACHINES
for Low-Cost High Production

facts tell the story { NEW CK USER BIG

KEARNEY & TRECKER MILWAUKEE

THE FACTS ON THIS JOB ARE:

Machine: New 25hp No. 5, Model CK Plain.
Material: Cast Steel, 150 Brinell.
Feed: 4½ inches per minute.
Cutter Speed: 100 surface feet per minute.
Rate of metal removal: 17.5 cu. in. per min.
Production rate: 4 parts per hour.

NOTE: Each part requires but a *single pass* of the cutters on the new Kearney & Trecker CK machine.

Old production rate: 1½ parts per hour—two passes required per piece.

MILLING MACHINE PAYS PRODUCTION DIVIDEND

NEW 25HP CK PLAIN MACHINE OUT PRODUCES PREVIOUS MACHINE NEARLY 4 TO 1!

CK MILLING MACHINE FEATURES THAT HELPED DO THIS JOB BETTER

Greater rigidity of new CK column easily absorbed vibration from heavy cutting load. Only single pass needed for each part.

New CK machines have Greater Horsepower. On this job, 25hp enabled operator to get maximum production from his cutters.

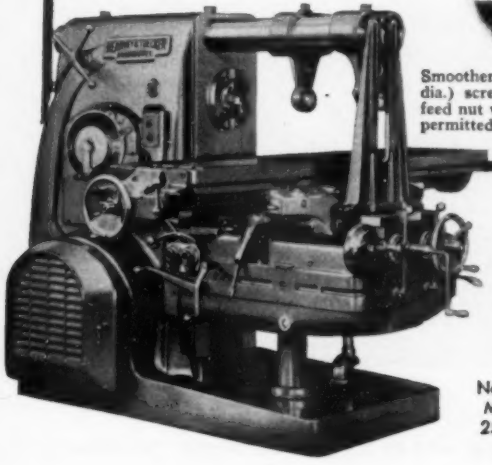
No. 60 heavy-duty drive flange around spindle nose permitted use of an extra-rigid heavy-duty arbor on this multiple cutter setup.

CK's 3-bearing spindle and flywheel assure Maximum Cutter Efficiency. On this job it meant fast metal removal and smooth finish in a single pass.

The new Kearney & Trecker CK milling machine doing this job has 24 different spindle speeds (13 to 1300 rpm.) Its 32 different table feeds range from ¾" to 90" per minute. Thus operator was able to *pick exact speed and feed* to get fullest advantage from high horsepower and modern cutting tools. This meant Greater Productivity on this job.

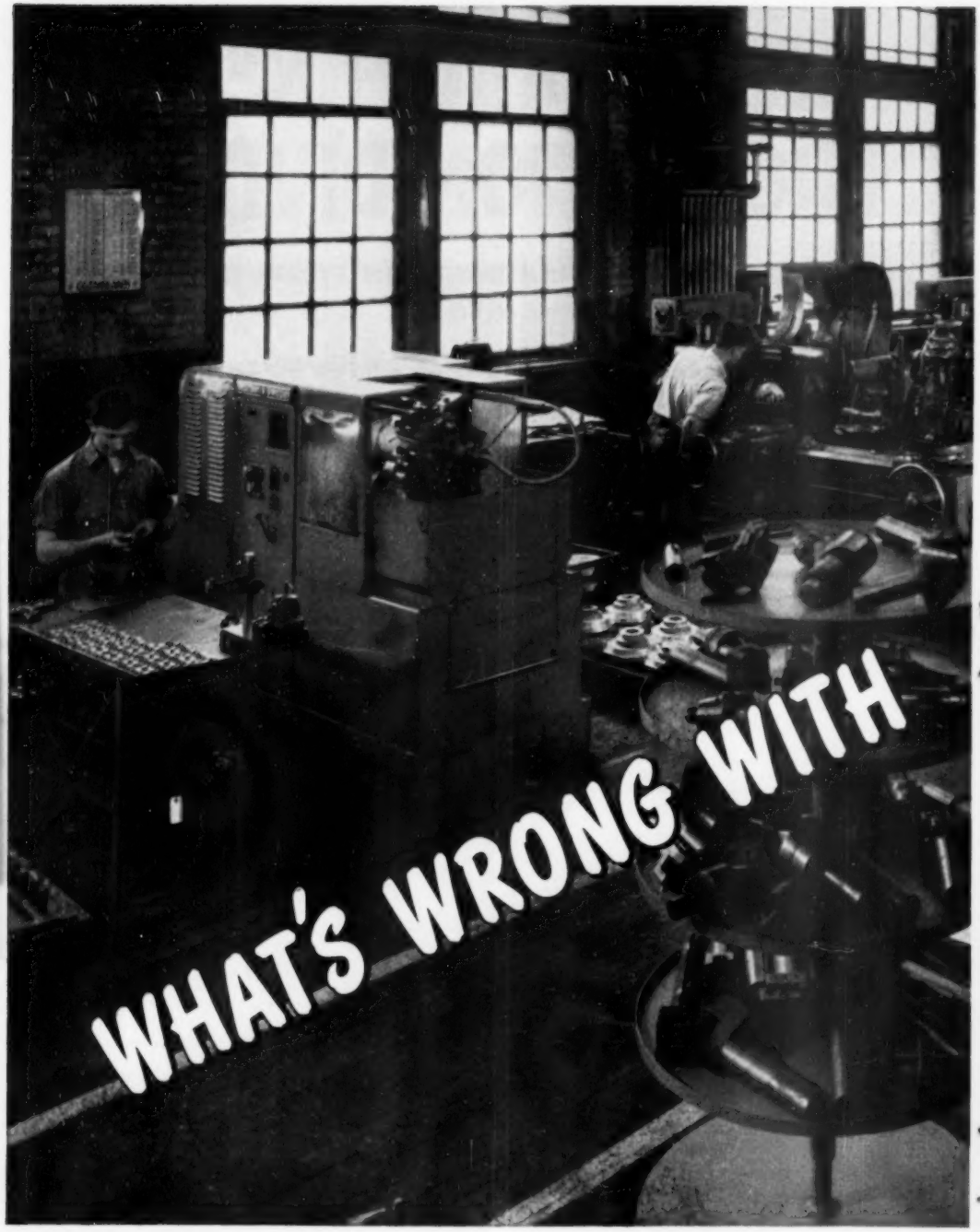
Smoother Feed of CK's large (2" dia.) screw and extra-long table feed nut with backlash eliminator permitted heavy cut.

CK's positive, metered pressure and automatic lubrication assured cool, wear-free operation in spite of heavy cutting load.



New No. 4 Model CK 25hp Plain

Investigate the new CK line of milling machines. You'll find every feature is test and job-proven to give you cost-cutting results . . . greater machine capacity, productivity and better finished products. Contact your nearest Kearney & Trecker representative or write: Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.



YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH WARNER

?

Nothing at all! But chances are any veteran shop man will instantly ask, "What's the idea of having an 'Automatic' in the turret lathe department?"

The "idea" is simply this: Warner & Swasey 1-AC Single Spindle Automatics can handle many of your regular small and medium lot runs *more profitably* than your hand-operated machines.

That's because the 1-AC operator can change setups quickly for the job at hand. There are no cams to change—he simply re-adjusts trips for feed, speed and stroke controls. And, on certain jobs, one man on a 1-AC can turn out more work, of more uniform accuracy, than two men on hand-operated machines.

To find out whether 1-AC Single Spindle Automatics fit into your production picture, call in your nearest Warner & Swasey Field Representative. He'll study your jobs and methods and advise you correctly.

& SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES

"There's NO END to the types of END MILLS made by MORSE!"

You name 'em . . . Morse makes 'em!

From left to right: short and stubby where the smallest, standard mill is required; double-ended if you prefer; with a *left*-hand spiral but *right*-hand cut to throw chips ahead; ball end for die cavities, fillets and round-bottomed, holes or slots.

Morse also makes 'em with two flutes, single or double end, cleared so as to cut to center, permitting plunge cutting; in taper shank styles for use direct in machine spindles; and the shell design, the old standby for face or slab milling cuts.

And there's a wide range of lengths in the exclusive, Morse Hi-Helix, shear-cutting design.

You name the job — Morse makes the End Mills . . . *no end of them!*

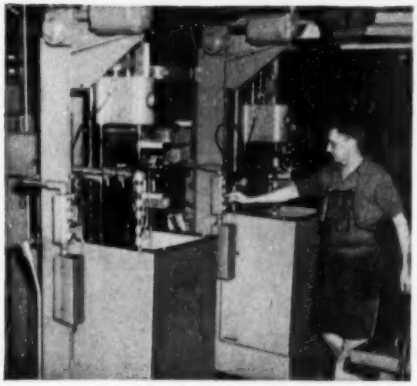
Morse Twist Drill & Machine Company
NEW BEDFORD, MASS.
(Div. of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Houston, San Francisco

MORSE
Cutting Tools

MORSE
MORSE
MORSE
NO. 22
IVAN NORMAN

WHICH OF THESE HEAT-TREATING PROBLEMS IS YOURS?

Westinghouse RF heating helped Saco-Lowell solve all six



Saco-Lowell Shops, makers of outstanding textile machinery, had always experienced problems with hardened bottom front rolls.

A Westinghouse 50 KW-450 KC RF Generator, with two standard vertical scanners, helped increase line production rates by 145% with total annual savings of $18,800.00. Direct labor costs have been cut 63%. Journal bearings are now ground after hardening, producing a higher quality roll. Formerly, every shaft required straightening; now this operation has been simplified and costs are reduced 70%.

Look at the results obtained by Saco-Lowell with a Westinghouse process that can handle 432 different rolls. Examine your heat treating problems. They, too, may be reduced, clarified, or eliminated entirely.

J-02243

Westinghouse Electric Corporation
Department M-43
2519 Wilkens Avenue • Baltimore 3, Maryland

Send me your informative case history booklet on induction heating.

Name .....

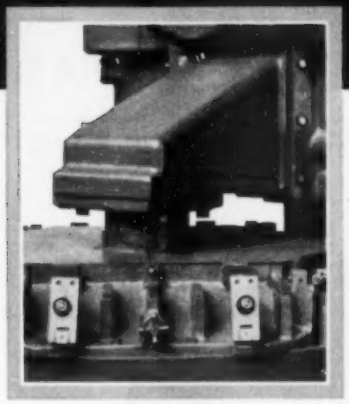
Company .....

Street .....

City ..... Zone ..... State .....

INDUCTION HEATING

"MARVEL" HAS



CENTER SUPPORT
Furnished when required

DESIGNED FOR HEAVY MILLING WITH CARBIDE CUTTERS

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

This representative example of Newton high production milling machines has the advanced features required for heavy precision milling with carbide cutters and motors up to 50 H.P. An unusually rugged frame provides the rigidity necessary to such operation. On long work pieces such as automobile and tractor cylinder heads, 36" between spindles makes possible the completion of the roughing cut before the finishing cut starts. Independent pick-off gears for each spindle provide the means for correct cutting speeds for both roughing and finishing cuts. Heavy flywheels, solidly attached to each spindle, insure maximum cutter life between grinds. Intermittent feed—rapid traverse attachment and center support are optional. Two standard table sizes. Other table sizes and spindle center distances are available. Newton Milling Machines, applicable to your precision milling problems, will help to step up your production and reduce your costs. Complete information will be furnished upon request.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED
MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK

"MARVEL" HAS always had the edge

MARVEL High-Speed-Edge Blades assure Faster, more Accurate cutting with proven Economy and complete Safety. Only the MARVEL is a composite blade with a high speed steel cutting edge electrically welded to an exceptionally tough, strong alloy steel body.

The High-Speed-Edge does the cutting while the alloy back, with hardened eyes, carries the load. Blade tensions up to 300% higher than those possible with ordinary blades are recommended. This greater tension is confined to the cutting or leading edge by the location of pin holes (exclusive MARVEL design feature) and cannot be overcome by work resistance. Heavier feeds and greater speeds are practical without "run out."

With greater accuracy, higher production and lower cost per cut, comes the extra dividend of Safety, for MARVEL High-Speed-Edge Hack Saw Blades are Positively Unbreakable—*they will not shatter.*

Ask your local MARVEL distributor (see classified phone book) to help you modernize your metal sawing with MARVEL High-Speed-Edge Blades. They cost no more than ordinary blades.

1. High-Speed-Steel cutting edge.

2. Tough unbreakable alloy steel body with hardened eyes.

1. & 2. Integrally welded to make a fast-cutting, long lasting composite blade that is *positively unbreakable.*

ARMSTRONG-BLUM MFG. COMPANY

"THE HACK SAW PEOPLE"

5700 BLOOMINGDALE AVENUE — CHICAGO 39, ILLINOIS

MARVEL Metal Cutting SAWS

Better Machines—Better Blades

72 hrs. of heat treatment

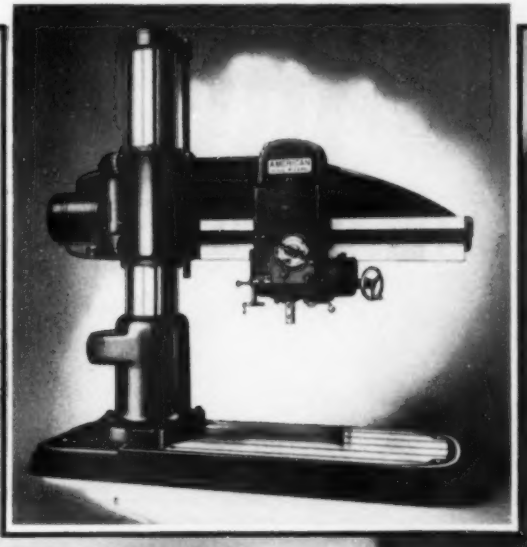
. . . required to produce the ultimate in radial drill spindles

"AMERICAN" Radial Drill Spindles are made of nitralloy. 20 hours of heat treatment from rough to finish, then 72 hours of nitriding are required to produce the wear-resistant spindles used in these radials.

Both the spindles and sleeves are nitrided to 110 degrees scleroscope. This is harder than some grades of cemented carbide. The sleeve is finish honed and the spindle ground and then diamond lapped to a sliding fit in the sleeve. Because of the lack of affinity between these two hard surfaces the clearance between them may be reduced to the very minimum, which in this case is .00025".

This results in the greatest possible stability, resulting in an ideal construction especially for accurate boring operations, which demand a high degree of smoothness and rigidity of the spindle.

This is but one of the super features that make the "AMERICAN" Hole Wizard an outstanding investment.



THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

WESTINGHOUSE
Life-Linestarter
PAIRED FOR PRODUCTION
Life-Line motor
DO NOT LUBRICATE

"Meets Our Biggest Demands...

without failures or down time!"

say users of this matched pair

"Install them and forget them. They're dependable under tough conditions". These words tell the Life-Line motor and Life-Linestarter® story best. See for yourself. Here are a few typical user reports.

A northeastern manufacturer states: "Our Life-Line motors have been running 144 hours per week for 18 months on twisting machines without breakdown or trouble . . . extremely satisfied with performance . . . maintenance time saved by elimination of greasing".

A watchcase manufacturer says, "Our punch-press motors were 14 feet off the floor . . . just high enough so that lubrication was often 'forgotten'. Frequent bearing failures and burnouts resulted until we perched pre-lubricated Life-Lines up there two years ago. Since then . . . no failures of any kind. We're standardized on Life-Lines".

About Life-Linestarters . . . the part of the team that assures positive motor protection . . . one user reports:

"Dirt collecting on contact surfaces was a constant headache, until we installed Life-Linestarters. Their clapper operation, with the contact in a vertical plane, has solved our problem of positive action once and for all".

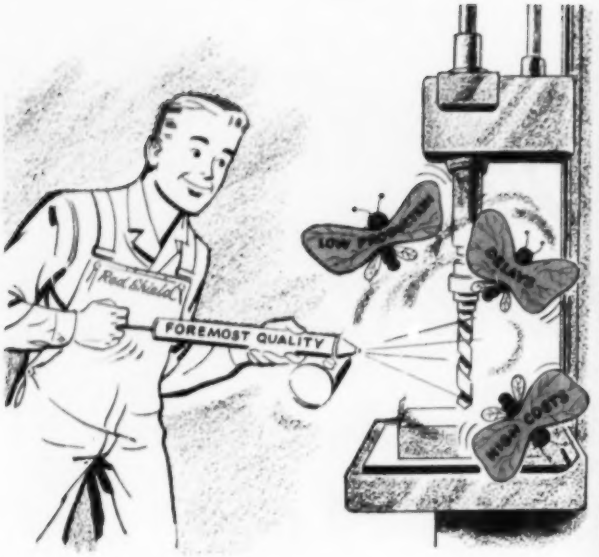
Another user writes: "Vibration and accidental jolts caused faulty operation . . . made us replace starters frequently. Then, two years ago we tried Life-Line-starters . . . and have not had an accidental fault since".

Typical? Yes. Typical of hundreds of reports in every industry. Why not install these dependable partners on your machines. A check with your Westinghouse representative will bring you full details. Ask for copies of "Life-Line Motor" B-3842 and "Tomorrow's Starter Today", B-4677, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-21633

Life-Line

MOTORS and CONTROLS



Gets the Bugs out of Drilling

YES, Standard Red Shield Drills do "get the bugs out" of drilling. Their uniform quality gives uninterrupted production, helps reduce costs.

For particularly tough jobs the advice of Standard Red Shield Service Engineers is always available—without cost or obligation. These "Standard" men bring you the "Know How" gained in our 71 years' experience in the manufacture and use of metal cutting tools.

Call the Standard Red Shield distributor in your town for tools and service. You'll find an organization of substantial business men who are able and interested in you. It will pay to Standardize.

STANDARD TOOL CO.

DEPT. 12-A, 3950 CHESTER AVENUE
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New York • Detroit • Chicago • San Francisco

STANDARDIZE AND SAVE WITH STANDARD RED SHIELD METAL CUTTING TOOLS. STANDARD DISTRIBUTORS IN MORE THAN 300 CITIES CAN SUPPLY YOUR REQUIREMENTS.

FOR MORE PRODUCTION FROM

Production Pointers from GISHOLT

TIME-SAVING IDEAS

Presented as a service to machine shops, we hope some of these interesting ideas, culled from thousands of jobs, will suggest ways to help you cut time and costs in your own metal work.

CROWDING 22 CUTS IN 2.5 MINUTES

Two Simplimatics Team Up for Rapid Production

Here's a rather intricate bevel drive gear blank that calls for 22 cutting tools to machine it. Normally, several operations would be needed to do the job.

Not this time. The job has been "*simpled*" down by the Simplimatic Automatic Lathe—with two machines handling all 22 machining operations. It's possible because the large platen table of this machine permits a flexibility of slide arrangements to bring more tools into work.

One operator tends both machines, with the 22 cutting operations split between the two so that a completed blank is turned out every 2.5 minutes.

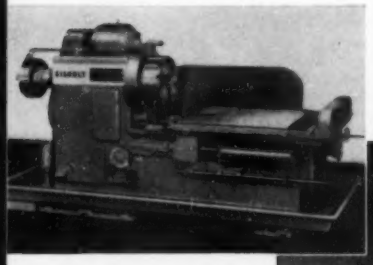
A Machine for Each Side

The first Simplimatic has a total of 14 tools arranged in the front and rear slides which do all exterior surfaces and the hub face. The part then moves to the second machine which has a total of 8 tools on three slides. The center slide handles the bore. The front slide roughs the taper face with a matched cut, while the rear slide finishes.

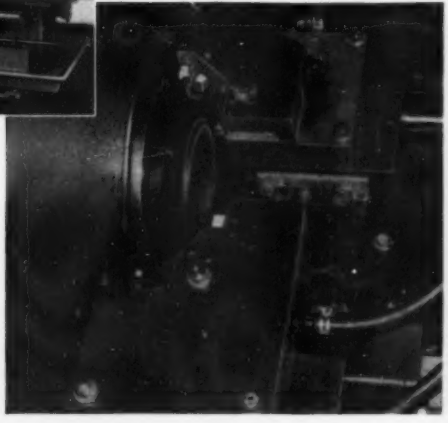
The almost limitless slide possibilities and large number of tool approaches of the Simplimatic allow this standard machine to do the job with all the benefits of a special machine.

The Simplimatic catalog pictures a wide range of interesting jobs. Ask for your copy.

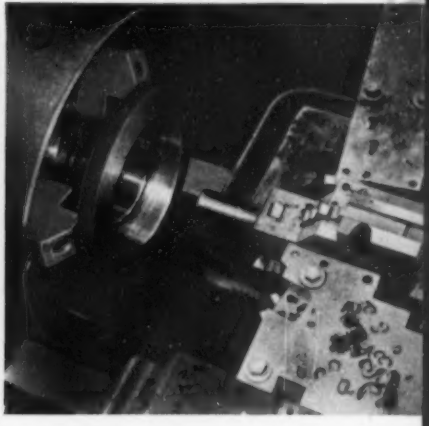
Tool setups for both Simplimatics.



Simplimatic Automatic Lathe.



1 First operation in machining the bevel drive gear blanks has 14 tools working on front and rear slides.



2 For the second operation, this Simplimatic has a center slide in addition to front and rear slides. Eight tools are used this time.

MAN-HOURS AND MACHINES

GISHOLT

TIME-SAVING IDEAS

HOW TO MAKE EASY WORK OF DEEP GROOVING

Special Attachment enables Standard Turret Lathe to do job

The large, heavy workpiece you see being handled here is a torsional vibration dampener for a diesel engine. The tricky part of the machining job is the cutting of two grooves around the 21" periphery—each 1 3/16" wide and 7 1/4" deep.

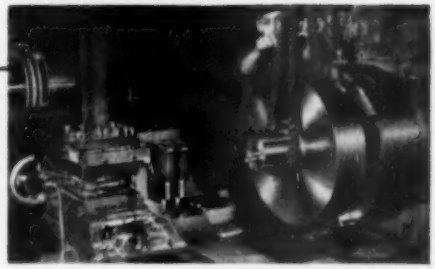
The work is divided into roughing and finishing operations on two 4L Saddle Type Turret Lathes, each having a special attachment on the standard cross slide carriage. This consists of a special bridge base bolted to the carriage wing at the front. This bridge also bears on the rear way and is held down and gibbed. On top of this fixed base is a tool slide block with extensions that clamp into the square turret. Thus, the forward motion of the cross slide and square turret carries the tool block and slide into the work.

The job starts with the first machine plunge cutting the two grooves to 1 1/4" width and full depth. Cuts are started at 17 r.p.m. and progressively increased to 31 r.p.m., with .006" feed used throughout. H.S.S. milling cutter blades, with a radius formed to curl the chips, are mounted in 1095 steel shanks.

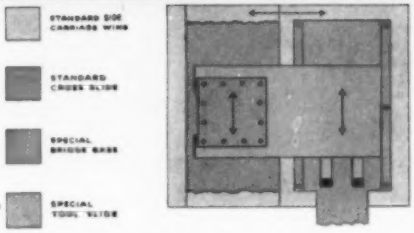
The part is then moved to the second machine where the grooves are increased to 1 3/16" width with the feed increased to .012". Finished width is held to .005", and the faces are held to .001" of perpendicular.

The weight, size and material of the part—250 lbs. in 21 inches of steel forging—are good reasons for using the sturdy, powerful Gisholt 4L Turret Lathes on this job.

On this simple adaptation of Standard Turret Lathes, heavy workpieces are deep grooved with ease and accuracy.



Loading the 250 lb. steel forging for first operations in cutting two 1 1/4" grooves to 7 1/4" deep. In background, second machine increases grooves to 1 3/16".

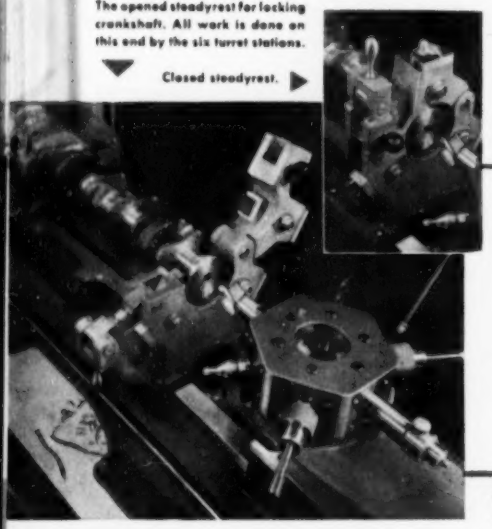


Schematic sketch of the special attachment on the standard cross slide carriage.

LONG BED TURRET LATHE FINISHES CRANKSHAFT END

The opened steadyrest for locking crankshaft. All work is done on this end by the six turret stations.

Closed steadyrest.

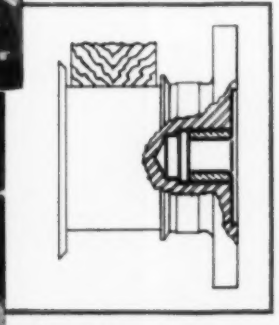


All Work Handled from Hexagon Turret

This standard No. 3 Ram Type Turret Lathe has a special job—machining the flange end of a six-cylinder automobile crankshaft. To suit it for this singular job, there is a 24" longer bed and the front carriage has been omitted.

The crankshaft is driven from the gear end. The driving fixture (which has been balanced on a Gisholt Balancer) is a hinged half-bearing which drives against the crank cheek. The other end of the crankshaft has the main bearing supported by a steady-rest equipped with end-grain hardwood shoes.

Machining operations are relatively simple—drill, counterbore, finish bore and ream. After these, a .0005" undersize bushing is placed on the turret arbor and pressed into the counterbore. This permits the bushing to be reamed from the final turret station. Floor-to-floor time is 3.1 minutes. It's a good example of how a Standard Turret Lathe can be inexpensively adapted to handle an unusual part with speed and precision.



Cutaway drawing shows work on crankshaft end.

Simple bed extension enables this standard Ram Type Machine to perform 6 special finishing operations on crankshaft ends with all work handled from hexagon turret.

GISHOLT

GISHOLT

TIME-SAVING IDEAS

ONE MACHINE OUT-PRODUCES TWO

No. 12 Hydraulic Cuts Time 70%

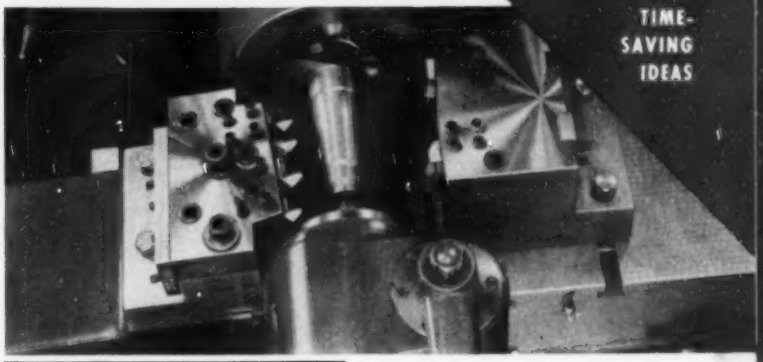
Here's a case where production of forged steel diesel injector bodies plodded along at 12 per hour with *two* lathes on the job.

Looking for a better way, this manufacturer found it—and did away with a second machine to boot. Now, the job is handled on one No. 12 Hydraulic Automatic Lathe at the rate of a completed part every 1.5 minutes—40 per hour.

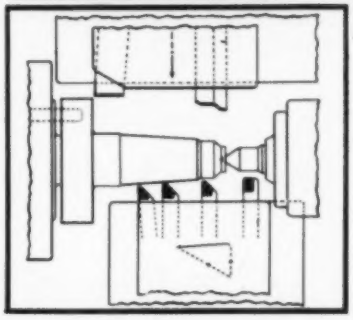
Four tools on the front carriage taper turn the entire length of the body. Two tools on the rear slide move in to face the shoulder and then drop into reduced feed to shave form the straight diameters. Tooling is well planned, permitting two other bodies of similar style to be handled with a minimum of changeover.

Because of the No. 12 Hydraulic's automatic cycle, the operator is able to handle another machine as well for even more production.

In a single automatic operation, this one No. 12 Hydraulic finishes parts in 1.5 minutes, which two machines needed 5 minutes to do.



Closeup of No. 12 Hydraulic Automatic Lathe tooled for machining injector body.



Tooling setup of front and rear slides of No. 12 Hydraulic.

New literature, showing 28 widely different jobs being done by this versatile machine, is now ready.

HOW TO MAKE BIG SAVINGS ON GEAR BLANKS

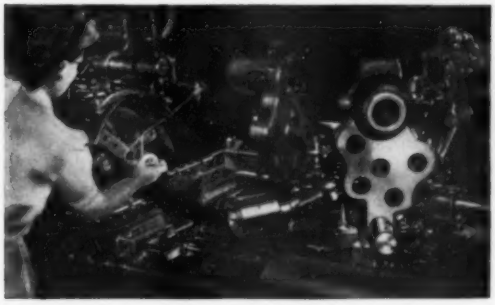
Four Times Faster Production on Fastermatic Automatic Turret Lathe

You don't need long runs to profit from the economies of the Fastermatic Automatic Turret Lathe. Here's a case where the Fastermatic with simple, standard turret lathe tools produces gear blanks in lots of 100 with real savings.

The operations are rough and finish turning, facing and boring. Where it required 8 minutes to do the job by the older method, floor-to-floor time is now a flat 2 minutes—a 400% production boost! Moreover, because the entire cycle is automatic, the job was turned over to a woman—making skilled man power go further. Not only are critical tolerances maintained, because of the reduction of the human element of a hand-operated machine, but operator also runs a 2nd machine.

Write for copies of the Fastermatic Catalog and Fastermatic Tool Catalog, showing the many standard tools available for production work.

The Fastermatic with standard turret lathe tools, operated by a woman, proves the savings in time and skilled man power this machine makes possible—even in medium runs.



Fastermatic setup for machining 25 gear blanks per hour.

Rough casting and finished gear blank 2 minutes after.

GISHOLT

GISHOLT

TIME-SAVING IDEAS

ONE MACHINE SUPERFINISHES THREE SHAFTS AT ONCE

Three-Station Superfinisher Does Large Volume Job

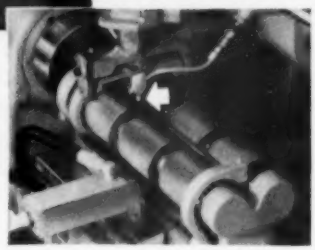
Special 3-station Superfinisher for handling three different parts at once.

Close-up of one station of the Superfinisher. Arrow points to Superfinish stone which makes 4 passes over stock rotated between the two Phenolic rolls.

Here is the way shafts of various lengths and diameters are Superfinished at once on one machine. This Superfinisher, a special model, has three stations, each handling a different size. Station 1 handles ¼" stock up to 9" long; station 2 takes ½" stock up to 16" long, and station 3 accommodates ⅝" stock up to 17".

Stock is loaded into each station and buttons pressed to start operations. Phenolic rolls then rotate the work while the head with two Superfinish stones comes into working position. The oscillating head makes four passes over the stock at the rate of 7½" per minute. After the fourth pass the head rises, an ejector raises the finished workpiece, and rolls it into a tote pan. The station then gets a new workpiece. All stations operate identically. Stock measures 15-20 micro inches RMS as it comes to the machine, and 3-4 micro inches RMS after Superfinishing.

One operator tends this 3-station Superfinisher to produce exceptionally smooth shafts.



Ask for book "Wear and Surface Finish," which gives complete, up-to-the-minute information.

HERE'S A REAL BALANCING DEPARTMENT

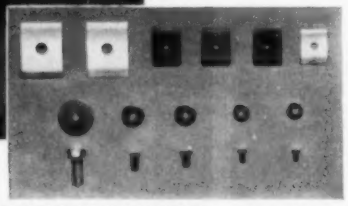
Wide Variety of Work Handled on Efficient Production Basis

The importance of balancing is given full recognition at the Buffalo Forge Company. This leading manufacturer of fan rotors uses balancing to eliminate vibration, premature bearidg wear and undue noise in these rotating parts.

Theirs is a true *production* setup, with all balancing done in a complete, separate department as a regular part of manufacturing operations. A variety of Gisholt Balancing Machines do static and dynamic balancing of parts weighing from two pounds to two tons. Both balancing and correction of unbalance are done on the same machines.

So fully systemized is this operation, even unbalance corrections are *pre-planned*. This is possible because the readings of unbalance can be set to whatever unit of correction is most convenient. In this case, it's in grams. The operators take direct readings from the balancers and then gather studs or rivets and washers, each having a given weight, for the needed combination to make indicated correction on any workpiece.

These parts can be used in any combination to provide the exact weight in grams for correcting unbalance in all size rotors.



The complete, separate balancing department at Buffalo Forge Company.

Gisholt Balancing Machines greatly simplify production balancing by enabling the user to read the measurements in the exact correction units most convenient for the work.

DYNETRIC BALANCERS

Production balancing like this is only one of many helpful subjects offered in the complete program of the Gisholt Balancing School. Write for full details and starting dates.

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

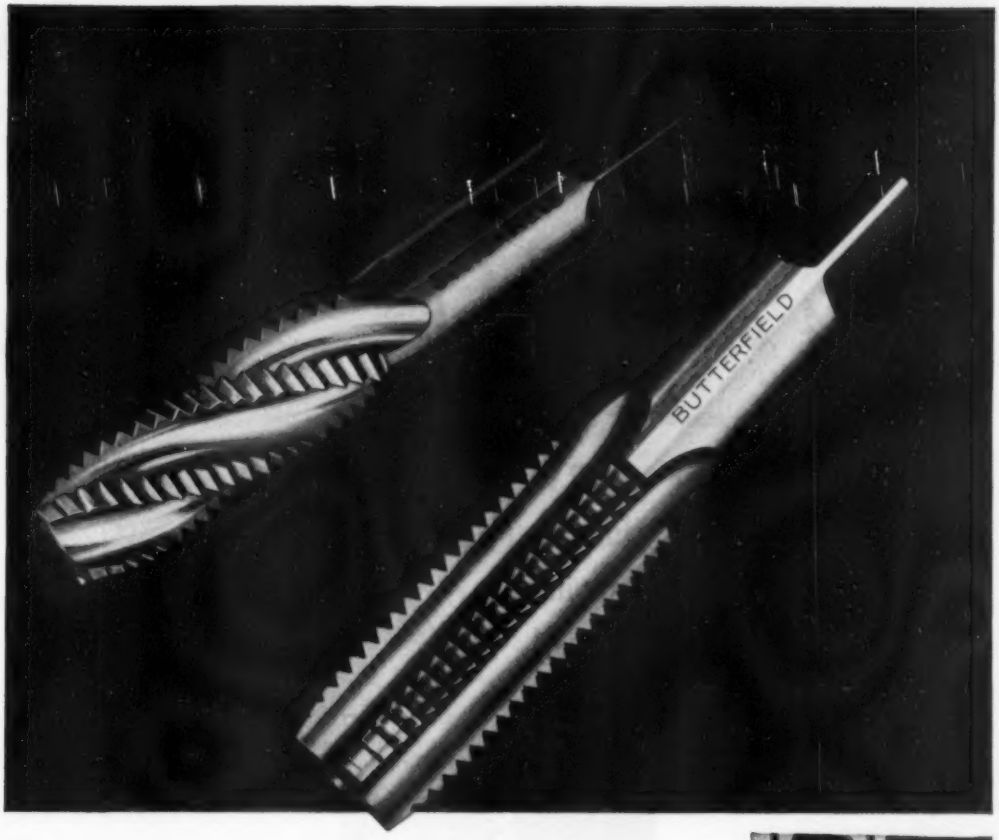
452
No. 581

GISHOLT

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

Write for your copy of Gisholt's new general catalog.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



THEY BRING ASSURED ACCURACY TO YOUR TAPPING JOBS

With Butterfield Taps you eliminate all risk of getting a defective tap that has been overlooked in ordinary factory spot-checking.

Each Butterfield Tap is individually inspected to make sure it will do a fast, clean, trouble-free job of threading.

That's why continued use of these 100% inspected tools is a long range policy that pays off in smoother, more economical production.

In the complete Butterfield line there's a tap for best results in every tapping application, in every material. Union Twist Drill Company, BUTTERFIELD DIVISION, Derby Line, Vermont. *In Canada:* Rock Island, Quebec.

INSPECTOR checks thread form and lead on a Hartness Comparator that magnifies 62½ diameters. Part of Butterfield's 100% inspection.

Hand Taps • Machine Screw Taps • Pipe Taps
Stove Bolt Taps • Pulley Taps
Staybolt Taps • Boiler Taps • Nut Taps
Serial Taps • Mud or Washout Taps

SEE YOUR NEARBY BUTTERFIELD DISTRIBUTOR FOR PROMPT DELIVERIES AND SERVICE

BUTTERFIELD
THE 100% INSPECTED TOOLS
Every Tool Individually Inspected
TAPS • DIES • REAMERS • SCREW PLATES

You can't lick this stamp!

. . . It was done on a KRW Hydraulic Press . . . famous for doing all kinds of stamping work faster, better, at less cost!

Sometimes minor production operations can become major headaches. Take the case of Buffalo Meter Co., makers of water, oil and specialty meters. Stamping the serial number on the lid of each meter was formerly done on a hand press and caused no end of trouble. Sometimes the number would not register exactly on the plate; sometimes the operator applied too much pressure and the lid was sprung. It was slow, tedious, inaccurate work, hard on the operator.

Buffalo Meter solved the problem with a 25 ton KRW Motor Driven Hydraulic Press. Now one man can stamp upwards of 300 meter lids per hour — more than four times as many as before. Each number is in perfect register. And there are no more sprung lids because each stroke of the KRW press produces exactly the same amount of pressure. It's a small job, but it illustrates the value of a KRW hydraulic press for any stamping job.

Any stamping or other pressing problems in your plant? Check with KRW. We have a full line—25 to 150 ton capacities; one, two and three cylinder models; hand operated, air operated or motor driven. If you need a *special* press, we'll build it for you.

Call your local Machinery dealer; or write, wire or phone Dep't. 11 for facts, prices and delivery dates.

SINCE 1916 KRW A MARK OF DEPENDABILITY

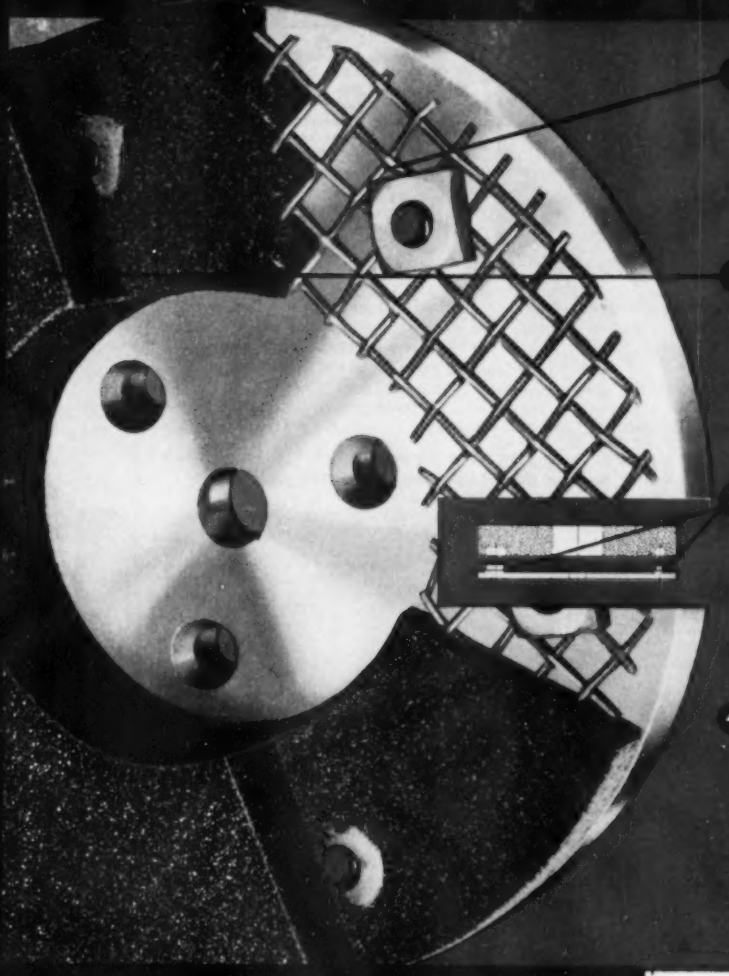
K·R·WILSON

215 MAIN STREET : BUFFALO 3, N. Y.

Designers and builders of Hydraulic Presses to meet any metal-working problem

Compare the Exclusive Features

of This Abrasive Disc With Other Makes



1 WIRE-LOKT CONSTRUCTION for positive safety

Heavy wire mesh is molded as an integral unit with abrasive. Provides maximum protection for operator.

2 JOB-FITTED ABRASIVES at no extra cost

Abrasives compounded to fit needs when necessary. Production records permit exact duplication for reorders.

3 TRU-LOK DISC MOUNTING for maximum precision

On GARDNER discs provided with the Tru-Lok feature, off-center mounting is impossible. Diamond Tru-Lok mounting aligns the holes in the abrasive disc and steel wheel exactly.

4 FIELD ENGINEERING SERVICE

A nation-wide service organization available to help you solve your flat surface grinding problems. Helps you obtain maximum efficiency and service from abrasive discs and equipment.

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Please send me a free copy of the Gardner Abrasive Disc Guidebook.

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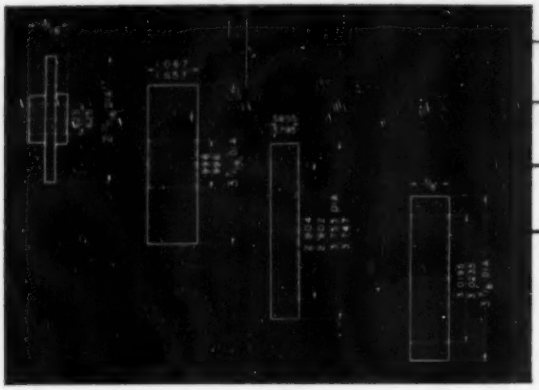
Could you use savings like these?



82.9% Material: C-1117 Steel
Acme-Gridley Model M Time: 36 sec.
Time by Previous Method: 3-1/2 min.

82.4% Material: C-1022 Steel
Acme-Gridley Model M Time: 38 sec.
Time by Previous Method: 3-1/2 min.

73.3% Material: C-1117 Seamless Tubing
Acme-Gridley Model M Time: 24 sec.
Time by Previous Method: 1-1/2 min.

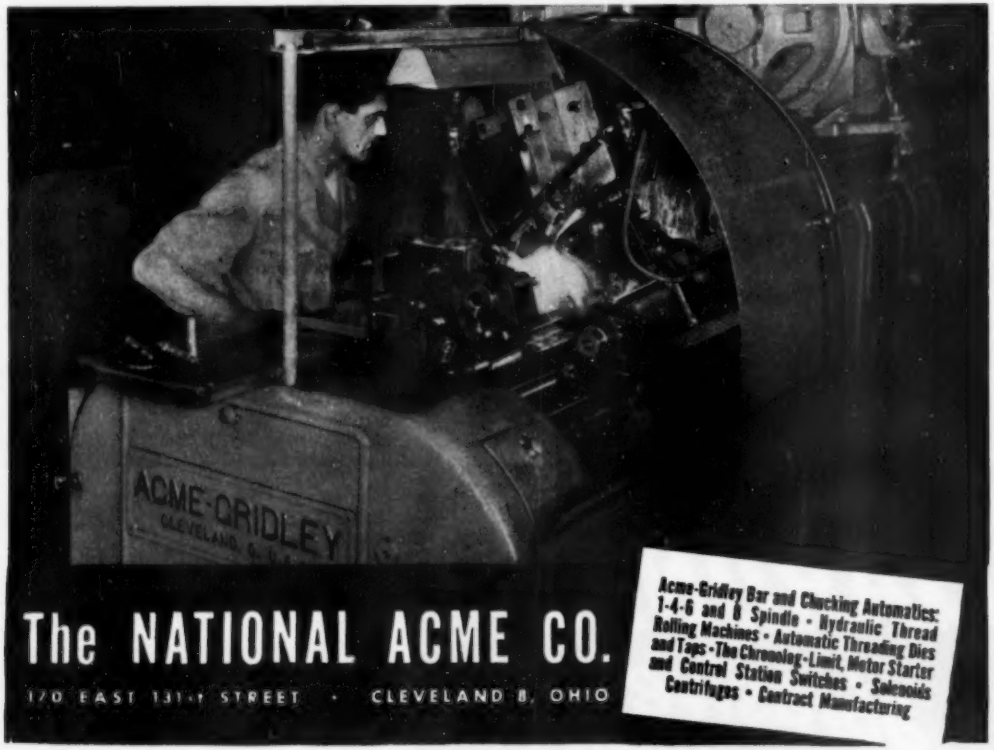
74.2% Material: B-1112 Steel
Acme-Gridley Model M Time: 1 min. 33 sec.
Time by Previous Method: 6 min.

These four jobs, done with an average saving of more than 75% of former machining time, are typical of the new Acme-Gridley Model M Single Spindle Automatic's performance.

Eight independently operated slides permit use of the speeds and feeds best suited to each cut, taking full advantage of the latest carbide-tipped tooling methods. You can get the right surface speed for a wide range of diameters through utilization of the three automatic spindle speed ranges.

These are but two of the basic design advantages that make this new Model M Acme-Gridley Automatic your best bet for increased production and lowered costs. For complete details ask for Bulletin M-50.

A metal-working manufacturer must look upon re-equipment as a continuing function. Otherwise, he's on the defensive, competitively speaking—and that doesn't score any touchdowns, goals or runs.



The NATIONAL ACME CO.

170 EAST 131st STREET · CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog-Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

Sign of Good Luck

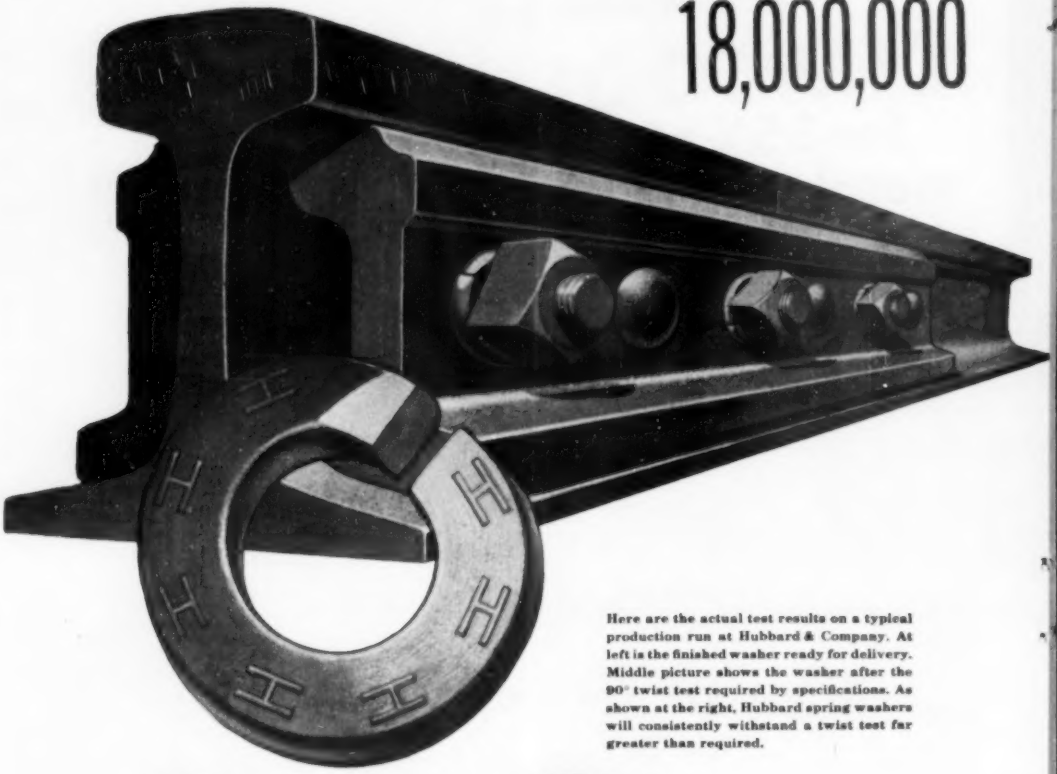
When Cimcool® is on the job, it's a sure sign that every day is a lucky day. For this radically new and different cutting fluid replaces all water emulsions and all but a few highly compounded specialty oils. *And does a better job!*

Cimcool was developed without help from a four-leaf clover. Long and careful research was required to perfect this revolutionary cutting fluid that is far superior to old-fashioned coolants. Cimcool is a *chemical emulsion* that permits faster speeds and increases tool life because it combines friction reduction and cooling capacity in a degree never before attained. It's longer lasting in machines. So Cimcool reduces down-time and cuts labor costs for cleaning and changing.

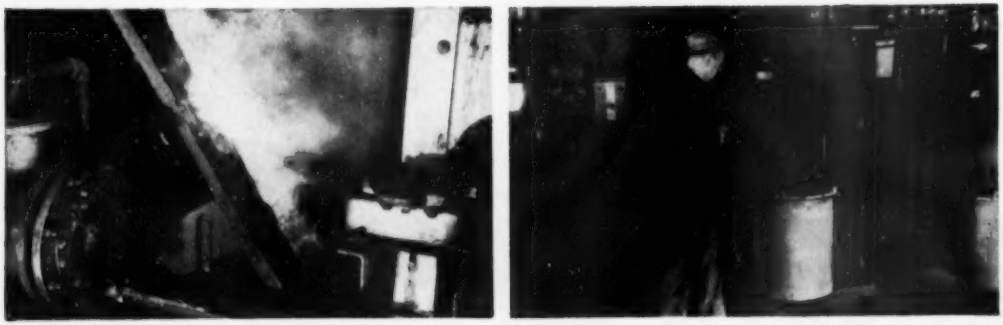
For a demonstration in one of your own machines, just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "CIMCOOL Defeats Heat." Address Sales Manager, Cincinnati Milling Products Div., The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

®Trade Mark Reg. U.S. Pat. Off.

HOW TO GET THE MOST OUT OF THE 18,000,000



Here are the actual test results on a typical production run at Hubbard & Company. At left is the finished washer ready for delivery. Middle picture shows the washer after the 90° twist test required by specifications. As shown at the right, Hubbard spring washers will consistently withstand a twist test far greater than required.



At Hubbard, this variable speed conveyor removes spring washers from the quench tank on a precise time cycle. Here, the washers enter a low temperature rotary furnace.

This rotary furnace removes the oil and assures desired temperature control prior to batch tempering.

LEAN ALLOY STEEL YOU'RE GETTING

Carilloy spring washers used without one reported failure!

thanks to U·S·S metallurgical assistance

HUBBARD & COMPANY, Tool Division, Pittsburgh, Pa., is a major producer of rail joint spring washers. These vital washers are used on the bolts of the joint bars that connect sections of railroad rails. They prevent the bars from "freezing" and interfering with expansion and contraction of the rails. Battering and wear at the rail ends is reduced due to the high bolt tension caused by the reactive pressure of these CARILLOY steel washers.

You could hardly find worse service conditions. Temperatures often vary 50, 60, even 70 degrees in a single day. And, because they are part of the rail joint, these washers must cushion the wheel load shock of trains that every day become longer, heavier and faster.

Some time ago, our metallurgists got together with Hubbard engineers and came up with a vastly improved method of heat treating these alloy steel washers. This heat treating system has achieved uniform heating, precisely timed quenching and fool proof tempering. Result: a higher quality product, more uniform than ever before.

HERE'S THE COMPLETE STORY:

"Failure reports have stopped"

says B. J. McTighe, Superintendent, Tool Division, Hubbard & Company

"Since installing our new heat treating system, we've sold about 18,000,000 spring washers without one reported failure. The improved heat treatment, suggested by United States Steel, has resulted in more uniform structure, better mechanical properties and a retention of spring properties under all conditions. We can meet specifications even if alloy steel restrictions become more rigid in the future.

"These spiral spring washers, made from CARILLOY 9260 steel, are hardened to an average of 49/52 Rockwell C. Despite this high hardness, the washers easily meet the specification requiring a 90° cold twist in the fully heat treated condition. Our own shop control limits are even more severe than this to make sure that we meet and exceed railroad standards.

"These washers have exceptionally high and uniform reaction values. After they are compressed, these washers return to their original contour while retaining their spring properties. We think the superior performance is due to our improved heat treating system."

If you're having trouble handling lean alloys, we may be able to suggest heat treatment methods that will give you more uniform hardness, less rejects and less retreatments. Simply call or write our nearest district sales office.

U·S·S Carilloy Steels

USS

UNITED STATES STEEL COMPANY, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

2-380

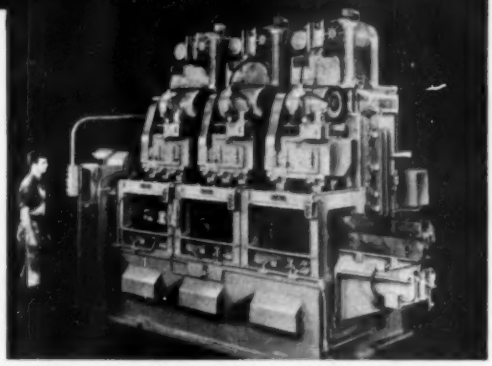
UNITED STATES STEEL

6 Examples of SUNDSTRAND ENGINEERED PRODUCTION

Basically, there are two approaches to solving production milling problems, (1) obtaining standard machines, then trying to process parts over these machines so as to meet production requirements, (2) designing the most productive processing method, then obtaining machines to suit this method — standard or semi-standard machines, if possible, or entirely special machines, if necessary.

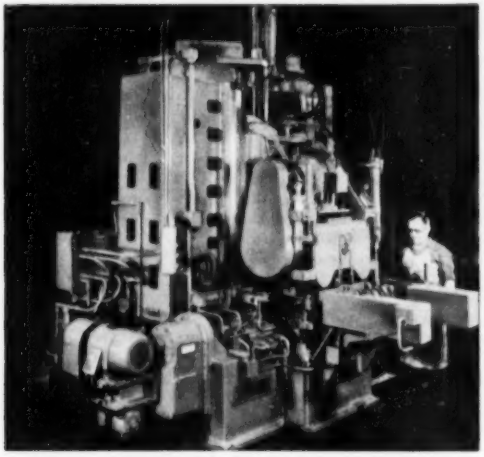
This latter method is Sundstrand "Engineered Production" . . . the most practical approach to economical metal working production.

Here are some representative examples of these machine tools and services offered by the Machine Tool Division of Sundstrand. Standard basic machine designs and units, coupled with methods engineering assistance, have resulted in many cost-saving Sundstrand installations. If you have metal working operations in your plant and are interested in lowering manufacturing costs, call in a Sundstrand representative. He'll be glad to assist you in obtaining more economical methods. There is no obligation for this service.



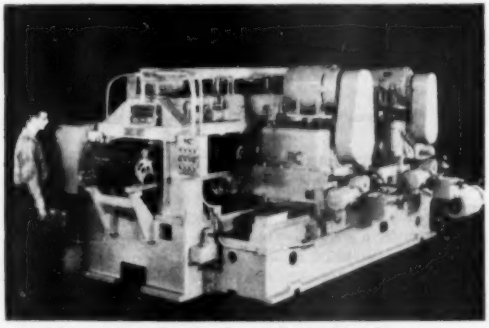
Milling And Notching Main Bearings Of 115 Cylinder Blocks Per Hour

Transfer type Rigidmil with 3 rise and fall heads. Operations include milling and notching the main bearings of cylinder blocks. Both ends of bearings are milled by the first two heads simultaneously, while third head mills the notches.



Milling Locating Notches In 96 Crankshafts Per Hour . . . .

This special Rise and Fall Rigidmil mills the locating notches in crankshafts. Parts are shuttled in and out of machine on conveyor. Head mounts 8 cutters, which mill notches in both sides of part.



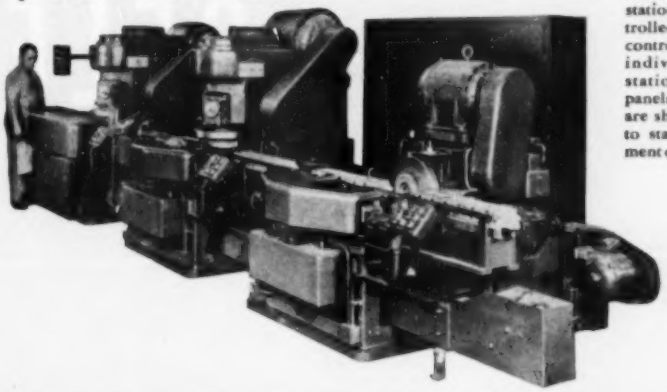
Milling Both Ends Of Cylinder Blocks At 86 Per Hour

This transfer-type Rigidmil simultaneously rough and finish mills both ends of 86 cylinder blocks per hour. Four opposed heads, two each for roughing and finishing, travel back to their feed start positions as blocks are shuttled to fixtures. Feed is 60 inches per minute.

SUNDSTRAND

RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

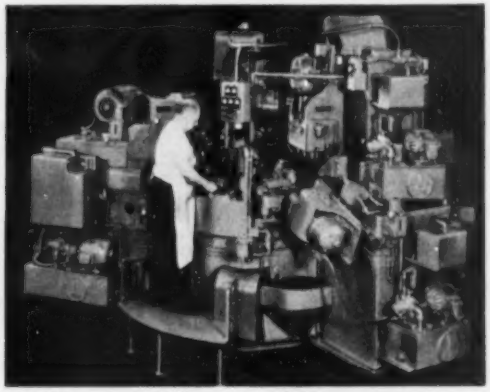
Milling Top, Bottom And Both Sides Of 44 Cylinder Heads Per Hour



Special transfer type Rigidmil with three milling stations, one turn-over, an idle station and loading and unloading stations. All stations controlled from the master control button panel or individually from the station button control panels. Cylinder heads are shuttled from station to station by the movement of the milling heads.

Mixed Lots Of 4 And 6 Cylinder Blocks Rough And Finish Milled

Traveling Head Process Rigidmil which rough and finish mills both ends of cylinder blocks in mixed lots of 4 and 6 cylinder sizes. Each of the two 25 HP opposed heads, operating simultaneously, complete rough and finish cuts in one automatic cycle.



Milling, Drilling And Counterboring 113 Manifolds Per Hour

Special 5 station process machine that completes milling, drilling and counter-boring of exhaust manifolds with one handling of part. All operations are performed at the rate of 113 manifolds per hour.

FREE

Additional Data
on any or all of these machines is available. For complete set of literature ask for bulletin 118.

SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2533 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

...SELECT

YOUR LATHES

From the complete line of 76 models built in LeBlond's 11-acre plant

- 12" TO 50" SWING
- 4' TO 100' BED LENGTH

Here's your guide to better, faster turning by LeBlond. It describes LeBlond's complete line of lathes. Write today for Catalog A.

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

LeBLOND *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 64 YEARS*

Tough little jobs become easy with

BEHR-MANNING *Special* Abrasive Tools

MUSHROOM* SANDING PADS AND DISCS
Shape and polish low areas as drawing-die work, deburr and polish edges, finish concave or flat surfaces.

METALITE® CLOTH SPIRAPOINTS®
Mounted on threaded mandrels, they produce high finishes in odd-shaped recesses or on various radii.

METALITE CLOTH PENCILS
Used on a mandrel for polishing channels, fillets, rounded corners, and the sidewalls and bottoms of "dead-end" holes.

METALITE CLOTH SLOTTED DISCS
When pushed into a hole, the slots enable the sections to overlap, polishing the hole surface. Fine for radiusing and deburring drilled openings.

SPIRACORDS®
Narrow strips of METALITE cloth wound spirally. Can be used on mandrel, or may be threaded like cord through holes for polishing and deburring edges.

SPIRABANDS®
For Deburring edges and finishing interior surfaces of drawn, sheared or stamped metal parts. Fit expanding rubber drums on portable tools.

*Trade marks.

Want to deburr a hard-to-reach spot on a production job, polish an inside surface, round a corner, chamfer an edge, or what have you? Among these BEHR-MANNING Abrasive Tools you will find just the right trick to handle the operation in jig-time and safeguard your profits. These tools are all adaptations of the famous BEHR-MANNING METALITE® Cloth, but so formed as to work on a mandrel or expanding drum, in any chuck on a portable or stationary spindle. They're available in a wide range of sizes and grits.

Look these tools over with your own production problems in mind. Make your own check-up, or better still let your local BEHR-MANNING Abrasives Engineer do it — write us.

The booklet "Blueprints for Production" gives various case histories that show you new ways to cut costs with BEHR-MANNING coated abrasives. Write for it — address Dept. AM-4.

BEHR-MANNING
CORPORATION
division of NORTON Company

▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE-SENSITIVE TAPES

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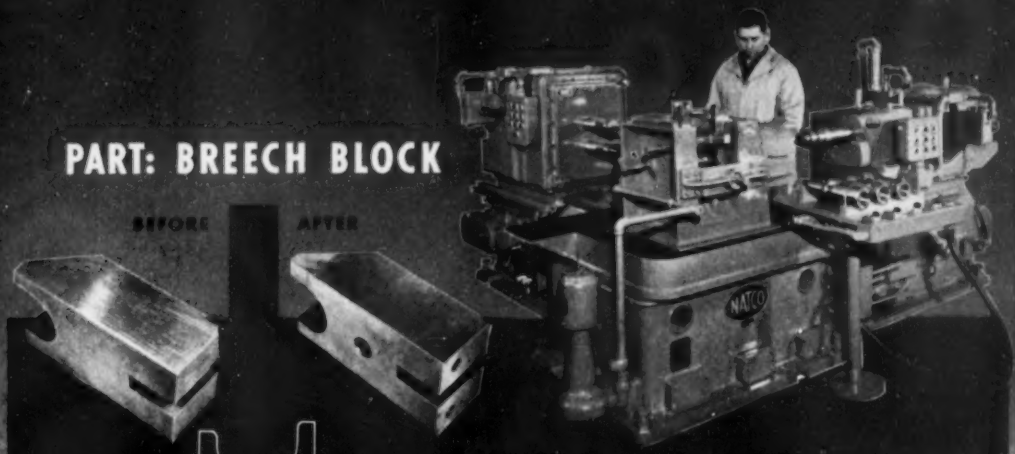
For Export: Norton Behr-Manning Overseas, Inc.

NATCO HOLESTEEL deep hole step-driller and counterborer

Automatic Safety Interlocking Tool Rack



Safety interlocking requires each tool be used in proper sequence before machine will operate.

OPERATIONS:
- Step Drill
- Core Drill
- Counterbore one diameter
- Counterbore second diameter

Natco Engineered for Quality Production

Call a Natco Field Engineer

to help you solve your problems in Drilling, Tapping, Boring and Facing

NATCO

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Distributors in principal cities. Branches in New York, Detroit, Chicago, San Francisco. Division of National Twist Drill & Tool Co.

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Your local Industrial Supply Distributor carries a complete stock of WINTER Taps.

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Standardize on NATIONAL END MILLS

For smooth, efficient operation at high speeds and feeds you will do well to standardize on NATIONAL Metal Cutting Tools.

NATIONAL TWIST DRILL AND TOOL COMPANY
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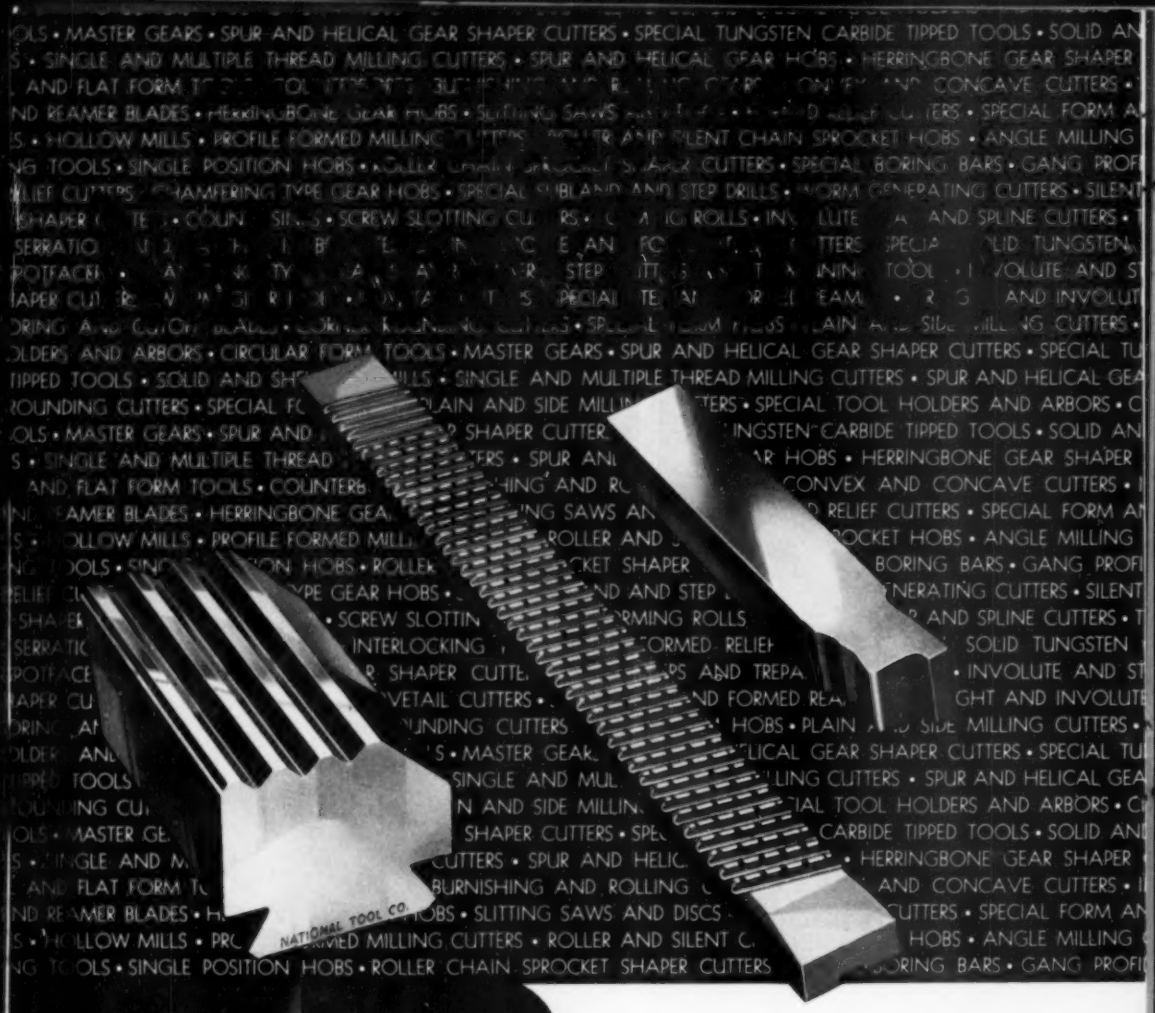
CALL YOUR INDUSTRIAL SUPPLY DISTRIBUTOR.



● Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

Since 1905 **engineers and manufacturers of high-quality special cutting tools for the metal-working industry**

National Tools Cleveland

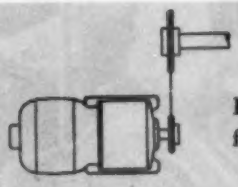
National
TOOL CO.
Cleveland 2, Ohio

Which of these speed reduction jobs is yours?

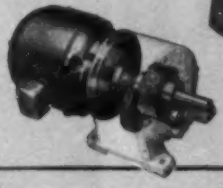
High-ratio reduction with right-angle takeoff?

Get a LINK-BELT Worm Gear Drive

Reduction ratios: 5.1:1 to 8000:1. Torque: 1400 to 125,000 in. lbs. Output shaft rpm: 0.22 to 564. Drawing shows motorized P.I.V. variable speed and worm gear drives direct-coupled.

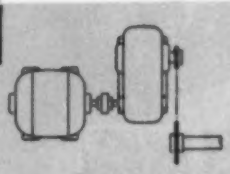


Restricted space for mounting?



Get a LINK-BELT Gearmotor

Reduction ratios: 6.2:1 to 292:1. Hp range: 1 to 30. Output shaft rpm: 6 to 280. Drawing shows gearmotor with roller chain drive.



High hp with parallel shaft takeoff?

Get a LINK-BELT Herringbone Gear Drive

Reduction ratios: 2.84:1 to 318:1. Hp range: ½ to 1000. Output shaft rpm: 2 to 600. Drawing shows motor with herringbone gear and roller chain drives.

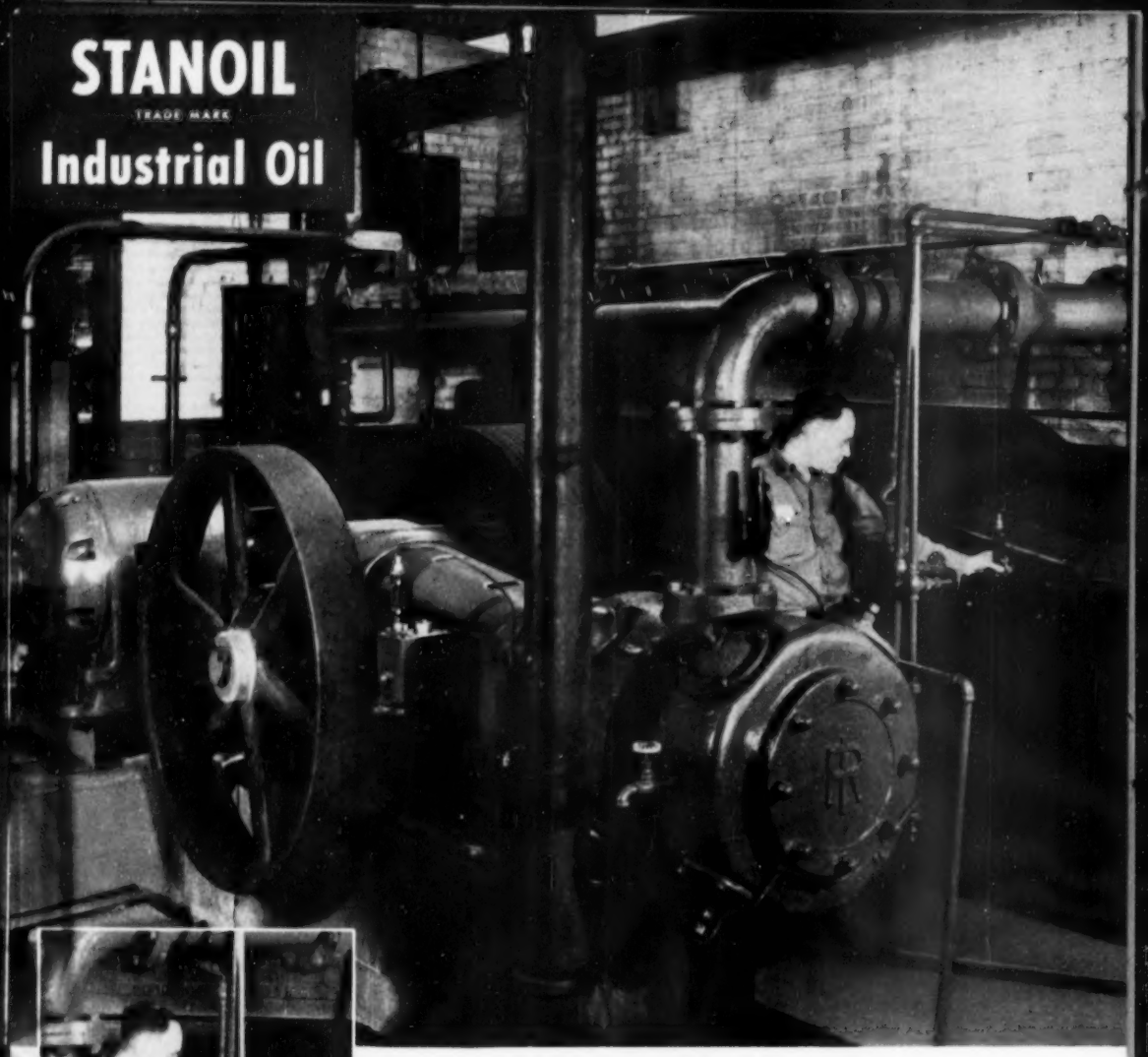
Yes, LINK-BELT builds all 3

NO LONGER need speed reduction be the limiting factor in a design or application problem. Because no *one* speed reducer solves every reduction problem, Link-Belt builds all three—Helical, Herringbone and Worm. Now it is only necessary to choose the right type of Link-Belt enclosed gear drive . . . and select the hp and reduction ratio that fit your requirements. You can get complete engineering information from the Link-Belt office near you.

LINK-BELT

ENCLOSED GEAR DRIVES

LINK-BELT COMPANY Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices, Factory Branch Stores and Distributors in Principal Cities.

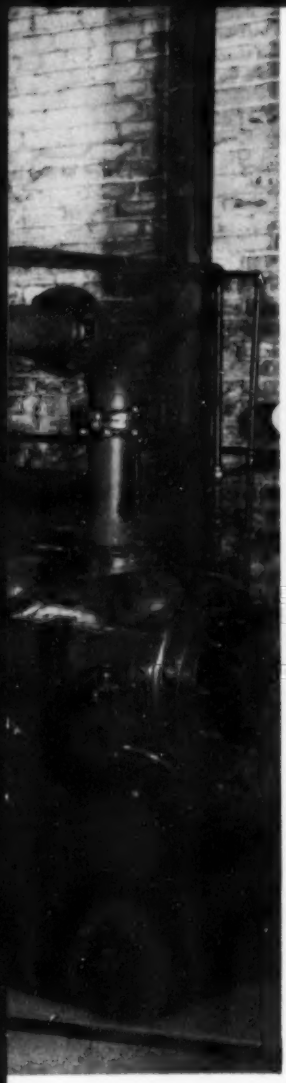


Compressors give carbon the air

• When carbon formed on the valves of these air compressors and the oil in the crankcases had to be changed frequently, officials of the Hayes Industries, Jackson, Michigan, called in a Standard Oil lubrication specialist. He recommended STANOIL Industrial Oil, a multi-purpose oil containing effective oxidation and corrosion inhibitors. With STANOIL, the compressors gave the air to carbon troubles and have breezed through four years of hard operation without difficulty. Over the oil previously used, STANOIL has given four times longer service in the crankcases. These results . . . similar to the results you may expect . . . have led to the use of STANOIL in other equipment in this plant.

Find how this multi-purpose oil can benefit you by discussing it with a Standard lubrication specialist. You can contact him by phoning your local Standard Oil office.

Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



What's YOUR problem?

L. H. Walker, who makes his headquarters at Standard's Detroit office, is the lubrication specialist who recommended STANOIL Industrial Oil to operators of this midwest plant and helped them solve a serious compressor lubrication problem.

L. H. Walker is one of a corps of able lubrication specialists who are located in Standard offices throughout the Midwest. These men have been specially trained in Standard Oil Lubrication Engineering Schools and, in addition, have a wealth of on-the-job experience. The specialist nearest your plant is ready to give prompt, expert, and thorough attention to your lubrication problems.

It's easy to obtain his services. A phone call to your nearest Standard Oil Company office will bring him quickly to your plant . . . with no obligation to you, of course.

Send for this booklet

SEE WHAT STANOIL OFFERS YOU

STANDARD

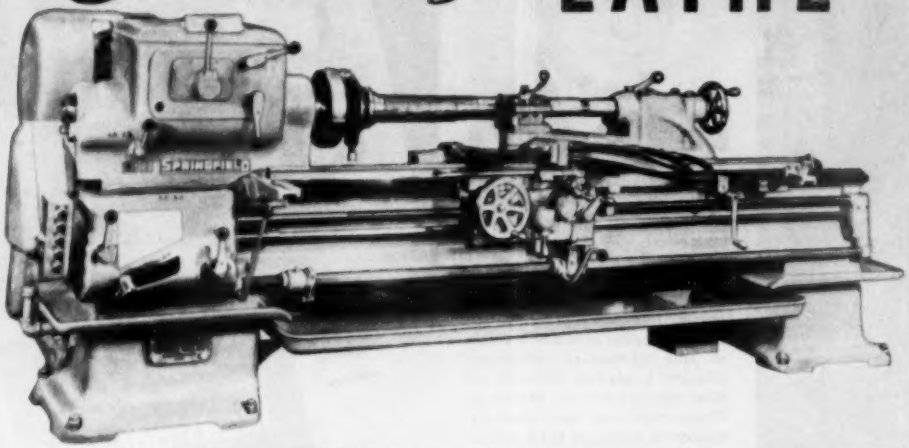
STANDARD OIL COMPANY

(I N D I A N A)

You'll find the means to significant savings in this booklet. It describes the important qualities of STANOIL Industrial Oil and the resultant benefits which have made this multi-purpose oil the choice of midwest manufacturers for a host of lubricating jobs. Discover how STANOIL will give you superior protection through its unique combination of six outstanding characteristics, including high stability and effective rust prevention. Find how STANOIL can simplify stock, storage, and inventory in your plant by replacing special-purpose oils in a wide variety of equipment. Ask the Standard lubrication specialist from your nearby Standard Oil office for this booklet, or write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

SPRINGFIELD

Contouring LATHE



The simplicity of the SPRINGFIELD Hydraulic Contouring Attachment is outstanding. Pilot or control circuits, remote control valves and other troublesome elements are eliminated. A motor driven hydraulic pump, relief valve and oil reservoir are the self-contained power unit furnishing hydraulic pressure to the servo-valve and full universal hydraulic compound rest. A supported and guided adjustable template holder conveniently holds templates at the front of the lathe in full view of the operator. There are no complicated mechanisms or fragile units.

SPRINGFIELD Hydraulic Contouring lends itself perfectly to lower production costs per unit on large or small runs.

Opposed hydraulic pressures in the hydraulic cylinder hold the slide solidly for heavy duty cutting.

Full universal hydraulic compound swivels to the best angle for contouring each individual job.

Standard SPRINGFIELD Lathes with swings from 14" to 32" are used in conjunction with the hydraulic contouring attachment thus giving complete standardization of components.

Quick changeover from standard SPRINGFIELD Engine Lathe operation to contouring is made easily.

Positive, smooth, continuous, backlash-free hydraulic movement gives superior finish on turning, boring or facing.

Close coupling of stylus, servo-valve and cylinder eliminate long hydraulic lines, sluggish action and resulting inaccuracies. The SPRINGFIELD Hydraulic Contouring attachment does not reduce the normal swing capacity of the lathe.

Write for Bulletin No. 184

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

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ELMIRA, N.Y.

PRECISION PRODUCTS
for
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60 Years of Experience

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Consolidated Vultee

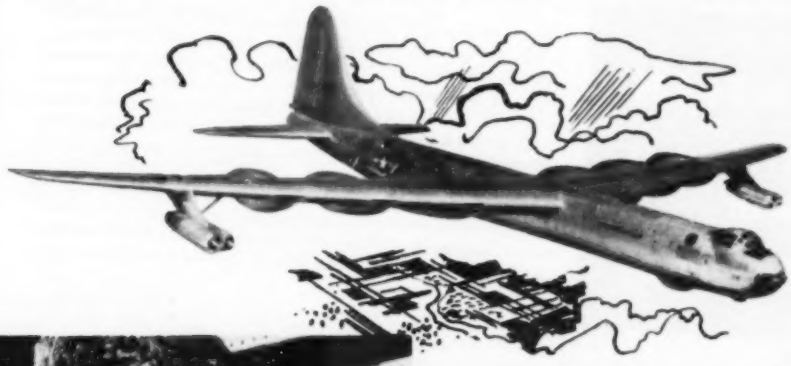
SKIL Drill—Model 49

The finest heavy duty ¼" drill made for production drilling in aircraft, trailer, auto body and furniture assembly. Model 49 is the first drill to feature contour grip handle to lessen worker fatigue and boost production.

Capacity in steel: 0" to ¼". Capacity in hardwood: 0" to ½". No-load speed: 1800 r.p.m. standard—higher speeds at no extra cost, lower speeds at extra cost. Full-load speed: 1270 r.p.m. Overall length: 7½". Weight 4 lbs.

buys 750 SKIL Drills

FOR PRODUCTION OF WORLD'S LARGEST BOMBERS



The Fort Worth division of Consolidated Vultee Aircraft Corporation is producing the long range B-36 bomber illustrated here.

To help produce these vital war planes, Convair bought 750 SKIL Drills and found them to be "of excellent design, lightweight, small and well-suited for hard-to-get-at areas."

In every field of industry, more and more manufacturers turn to SKIL Drills and other SKIL Tools for dependability and service. SKIL sales are made by SKIL reputation for quality and performance!

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PORTABLE TOOLS

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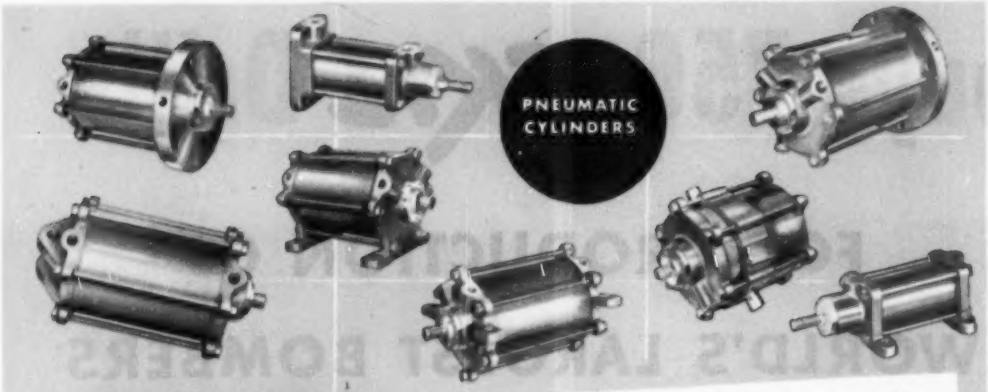
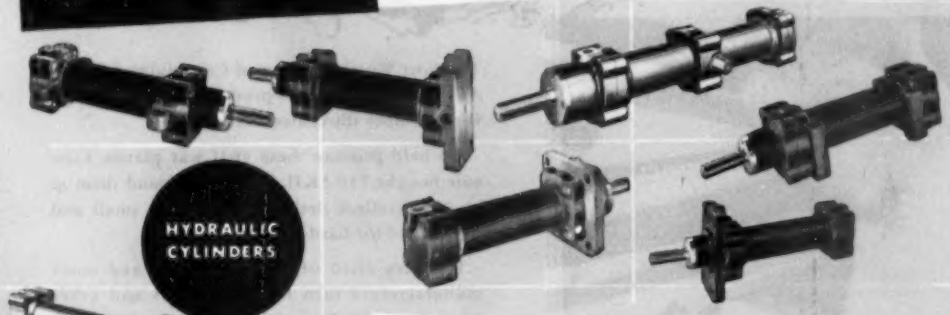
SKILSAW Factory Branches in 34 Principal Cities. In Canada: Skiltools, Ltd., 3601 Dundas Street West, Toronto 9, Ont.



HANNIFIN
has the cylinders to fit Your Machines

Here's your single source for the broadest line of cylinders made. In hydraulic cylinders alone there are 12 bore sizes, 11 standard mountings . . . more than 65 combination mountings. In pneumatic cylinders . . . 7 standard mountings, 2 types of piston, bores to 16". Hannifin standardization includes complete tooling to insure the accuracy of mounting dimensions . . . makes it easier for you to assemble these cylinders into your machines.

And every Hannifin cylinder is built to exacting quality specifications, possessing features that make them "work better . . . last longer." A factory-trained Hannifin Field Engineer is ready to consult with you on your hydraulic and pneumatic cylinder requirements.



Write for Complete Catalogs

BULLETIN 110-B. 56 illustrated pages of design features, styles, dimensions, bore tables, engineering data and formulae on Hannifin Hydraulic Cylinders.

BULLETIN 210. 52 illustrated pages of design and construction features, bore tables, mounting styles, etc., on Hannifin Pneumatic Cylinders.

do ALL you CAN do . . . with

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Hannifin Corporation, 1117 S. Kilbourn Ave., Chicago 24, Ill.

Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Hydraulic Riveters • Air Control Valves

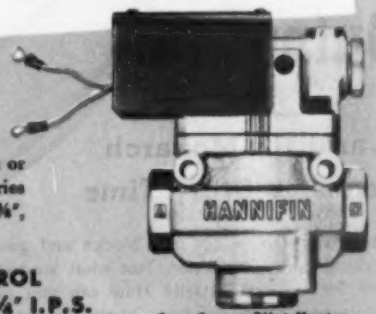
AND NOW! HANNIFIN ANNOUNCES P-M Pilot-Master Valves!

...NEW AND BETTER VALVES FOR THE DIRECTIONAL CONTROL OF AIR PRESSURE

Hannifin proudly announces a brand new line of piston-operated poppet-type valves for the better control of air pressure. Called P-M (Pilot-Master) Valves, they are pressure operated, either from a remote pressure source or by integral pilot heads.

Ingenious design and adroit engineering have been combined to provide advantages not found in any other valves. For example . . . a removable cartridge contains every moving part of the main or "master" valve, is replaceable without breaking line connections . . . the basic 3-way units operate either 2-way or 3-way, Normally Open or Normally Closed, without any internal change whatsoever . . . choice of either electric or pneumatic control greatly simplifies complicated hook-ups.

You'll want to know more about this P-M Pilot-Master line . . . the most versatile air control valves ever developed. Why not investigate today?



2 or 3-way Pilot-Master Valve with Solenoid Pilot Head-Series S-2

FOR ELECTRIC CONTROL

2-Way, 3-Way and 4-Way Pilot-Master Valves

Integral pilot heads, solenoid controlled, are combined with main or "master" valve bodies to form these Pilot-Master Valves. Two series of 3-way valves, ⅛" to 1¼" I.P.S. Two series of 4-way valves, ⅜", ½", and ¾" I.P.S.

FOR ALL-PNEUMATIC CONTROL

Your choice of 10 Pilot Valves, ¼" I.P.S.

Connect them to 3-Way or 4-Way Master Valves

Series B-1 Master Valve
The basic 3-way unit with plain head for remote control—use it 2-way or 3-way. Sizes: ⅛", ¼", ¾", 1", and 1¼" I.P.S.

Series BB-1 Master Valve
Actually two 3-way valves in one compact, common body—pressure controlled. Sizes: ⅛", ¼", and ⅜" I.P.S.

FEATURES YOU'LL WANT TO KNOW A LOT MORE ABOUT

Fewer valves to stock • Fewer parts to stock • Unique piston-poppet • Removable cartridges • High speed operation • Long-lived solenoids • and many others...

GET the FULL Story

Every tool and design engineer will want a copy of the colorful new broadside that completely describes the new line of Hannifin P-M Pilot-Master Valves. Write for Bulletin 231.

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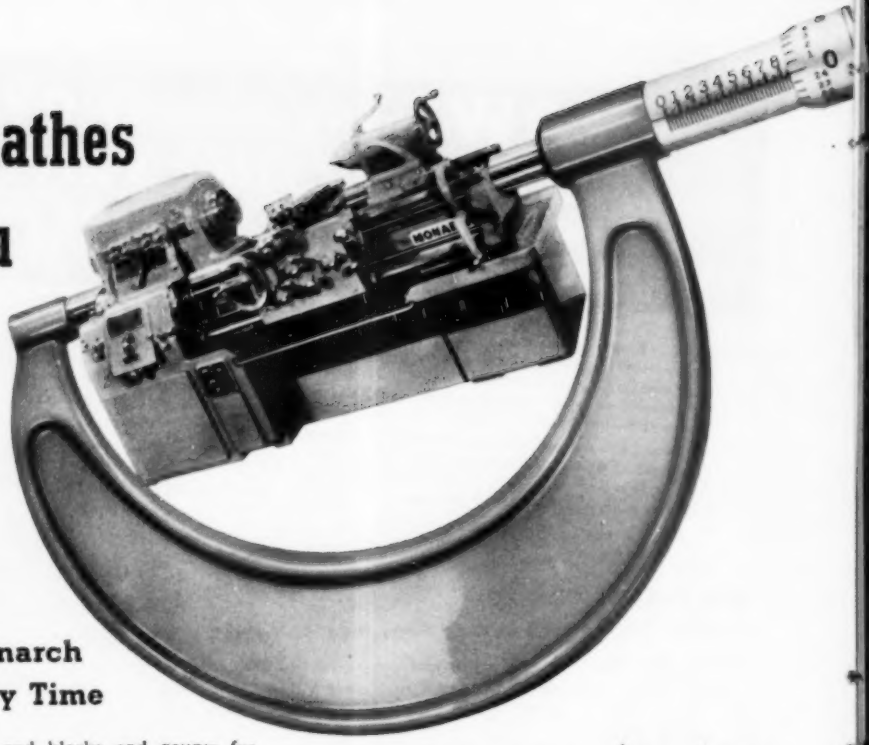
Hannifin Corporation, 1117 S. Kilbourn Ave., Chicago 24, Ill.

Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Hydraulic Riveters • Air Control Valves

Check Lathes Like You Check Their Output



...and it's Monarch Series 60 Every Time

You have your mikes and blocks and gauges for checking lathe production. But what kind of test is there for the lathe itself? How can you gauge its performance *before* you buy—at the time when you're establishing the standards for the quality and costs of your entire operation?

This way! Lathe performance is only a reflection of the quality built into a lathe—of its features of design and construction. *So check features*—and check them against the handy yardstick here.

Check, too, the strength, weight and power built into each machine. You not only find every desirable construction feature in the Monarch Series 60—you'll find that *almost every one of them was originated* by Monarch. Doesn't that make the Monarch Series 60—Toolmaker's and Engine Lathes, both—the standard that you're looking for? Write for Bulletin 1113, and see for yourself . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

LATHE FEATURE CHECK-LIST	MONARCH	LATHE B
1 Totally enclosed gearbox and end gearing—for sustained accuracy	Yes	?
2 Automatic pressure lubrication—for long life at original efficiency	Yes	?
3 All anti-friction bearings—for peak power and reduced maintenance	Yes	?
4 Hardened, ground or shaved, wide helical gears in headstock—for precision power, easier shifting	Yes	?
5 American Standard Camlock Spindle Nose—for quick, rigid chuck and fixture mounting	Yes	?
6 Flame-Hardened and Precision-Ground Integral Bedways—for sustained accuracy throughout the life of all four ways	Yes	?
7 All critical parts made of hardened a'loy steel—for long, trouble-free life	Yes	?

Your proof of protection on all Series 60 Toolmaker's and Engine Lathes, available in 12", 14", 16" and 20" swings—each in various lengths. Most can be equipped with either one of the three Monarch Tracer Controls.

Monarch
ACCURACY + ECONOMY + LONG LIFE
TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

UNION TWIST DRILLS are made in the broadest range of types, to cover every drilling operation — no matter what your material or drilling equipment may be.

For fast, free-cutting performance, minimum breakage and more work between re-sharpenings, see your Union Distributor for the drills that are *right* for *you*.

FIRST TEAM IN CUTTING TOOLS . . .

UNION *and your* ***Local Distributor***

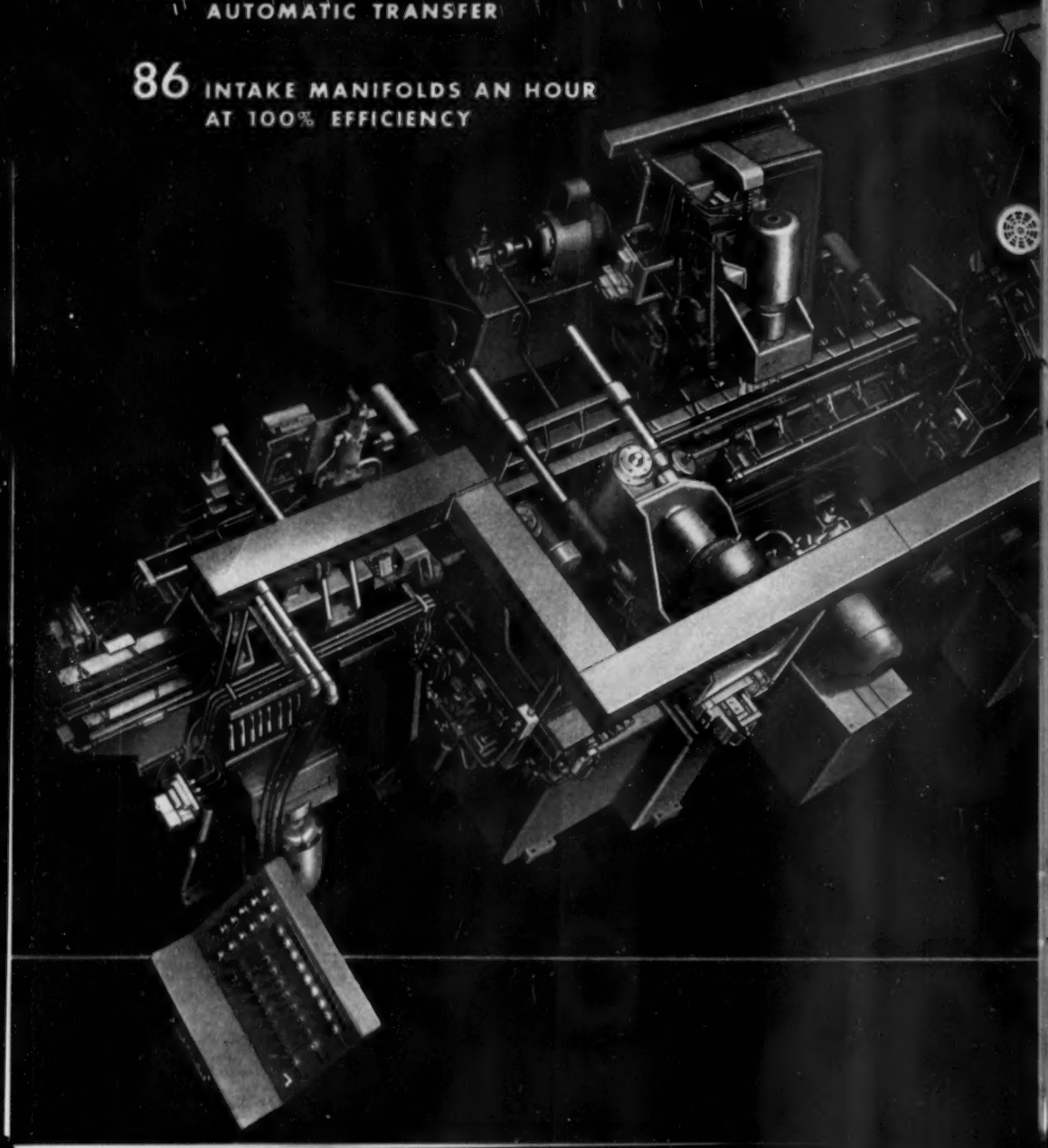
UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS • Milling Cutters • Gear Cutters • Twist Drills • Hobs • Reamers • Carbide Tools

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass., Taps, Dies, Screw Plates . . . BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers, Twist Drills . . . BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates

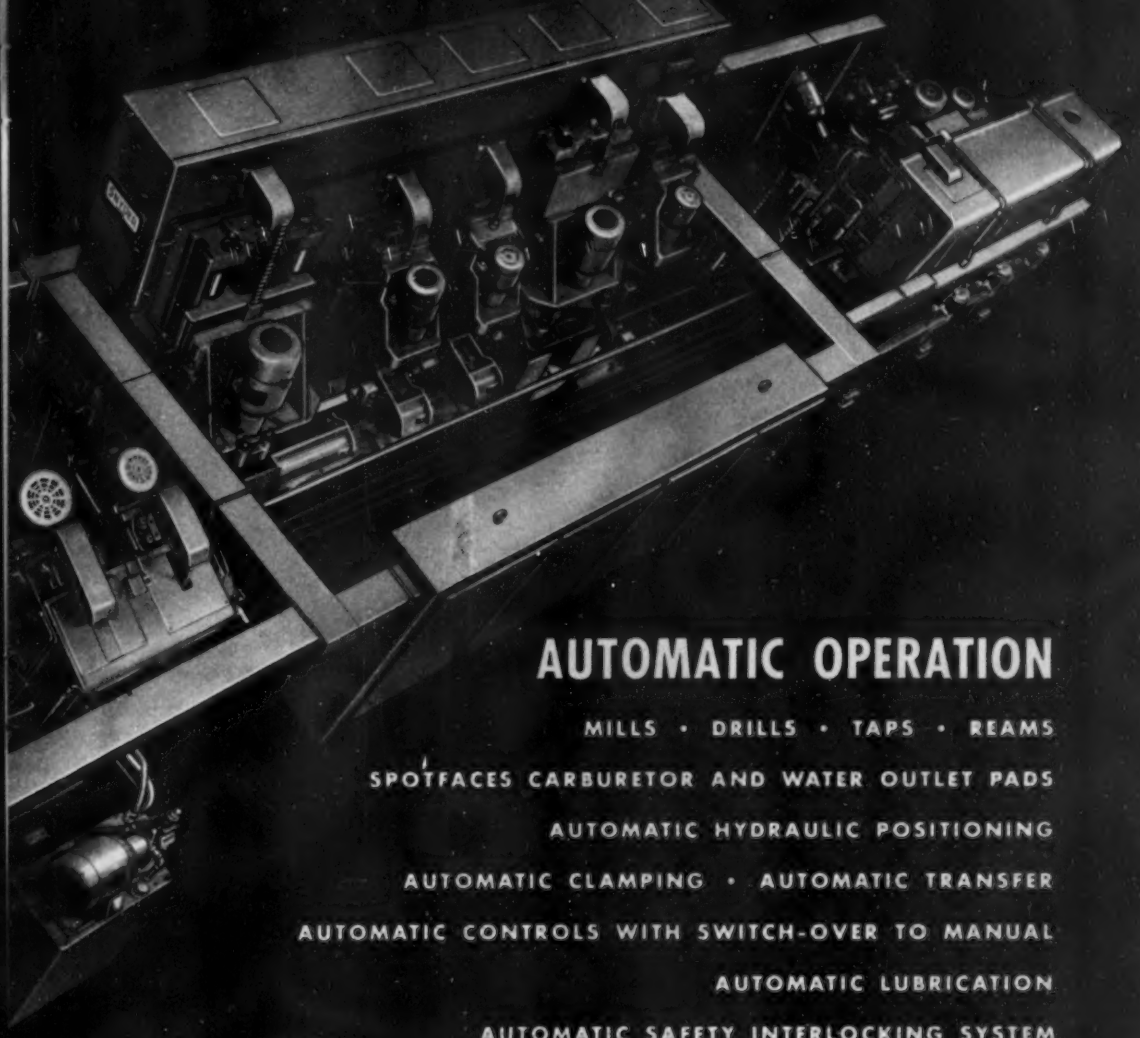
SNYDER MACHINES CONTROL COSTS

22 STATION
AUTOMATIC TRANSFER

86 INTAKE MANIFOLDS AN HOUR
AT 100% EFFICIENCY



INDUSTRY DOES THE



AUTOMATIC OPERATION

MILLS • DRILLS • TAPS • REAMS
SPOTFACES CARBURETOR AND WATER OUTLET PADS
AUTOMATIC HYDRAULIC POSITIONING
AUTOMATIC CLAMPING • AUTOMATIC TRANSFER
AUTOMATIC CONTROLS WITH SWITCH-OVER TO MANUAL
AUTOMATIC LUBRICATION
AUTOMATIC SAFETY INTERLOCKING SYSTEM
SKILLED OPERATORS NOT NEEDED

SNYDER

TOOL & ENGINEERING COMPANY

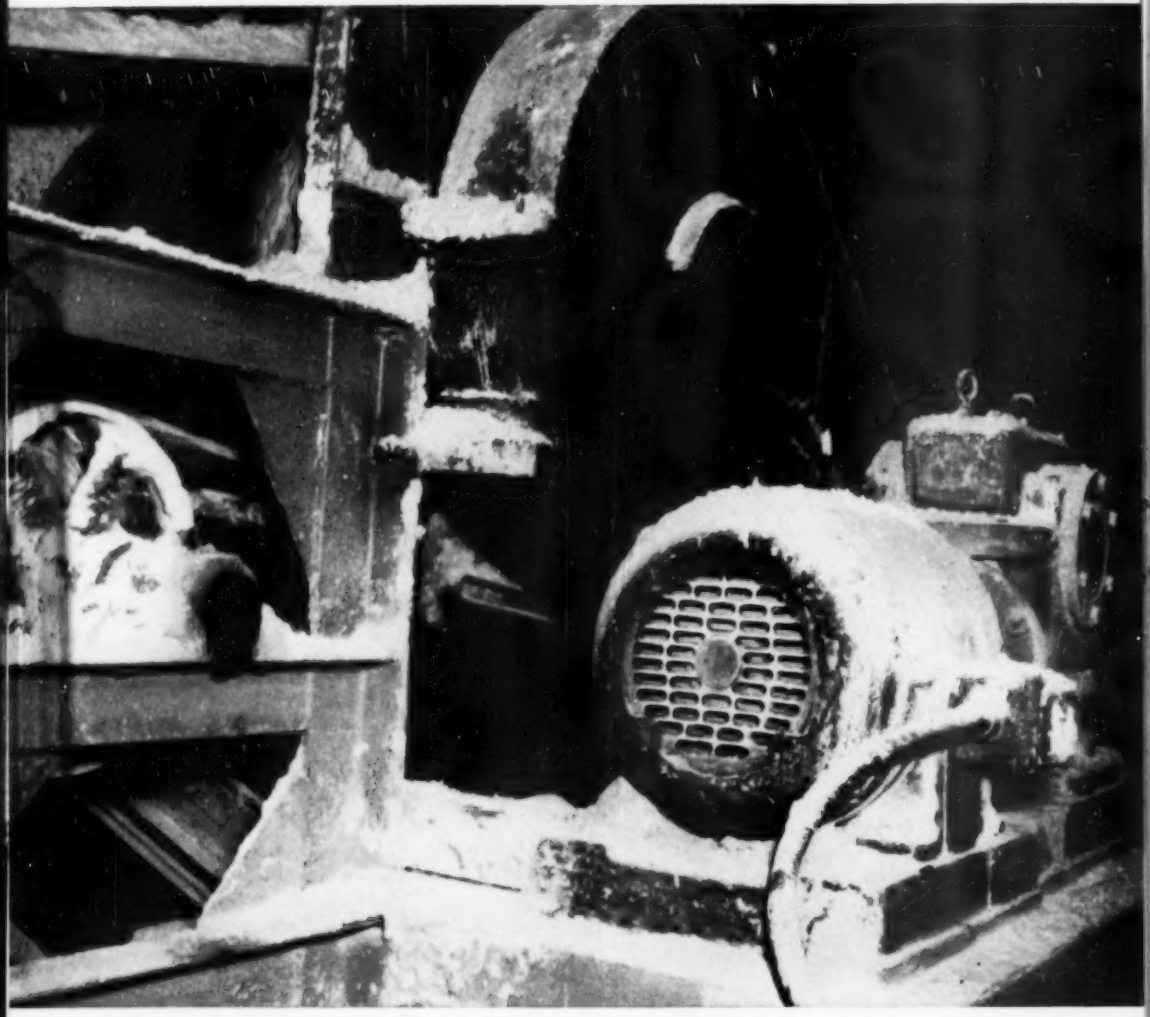
3400
E. LAFAYETTE

DETROIT 7,
MICHIGAN

26 Years of Successful Cooperation with Leading American Industries

TOUGH JOBS WITH

INDUSTRY DOES THE



THE CHEMICAL INDUSTRY depends on standard, "off the shelf," Tri-Clad motors in the most adverse operating conditions, including corrosive, abrasive and explosive atmospheres. The 7½-hp totally-enclosed fan-cooled Tri-Clad motor above drives a crude ash conveyor an average of over 23 hours every day.

GENERAL ELECTRIC

752-12

TOUGH JOBS WITH TRI CLAD MOTORS

REG. U.S. PAT. OFF.

EXTRA PROTECTION

Every Tri-Clad motor, open or totally-enclosed, is triply-protected against *physical damage, electrical breakdown* and *operating wear and tear.*

That's why you'll find general-purpose Tri-Clad motors in every industry—not only on the usual jobs which they do so economically—but on the *tough* jobs where unfailing performance is a must.

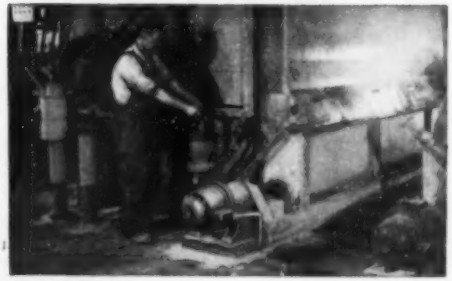
PROMPT DELIVERY

Today especially, delivery and service are important. G-E shipping points all over the country are ready to deliver most standard ratings right out of stock. And with the most complete service shop network in the motor industry you are assured of the best attention to motor problems.

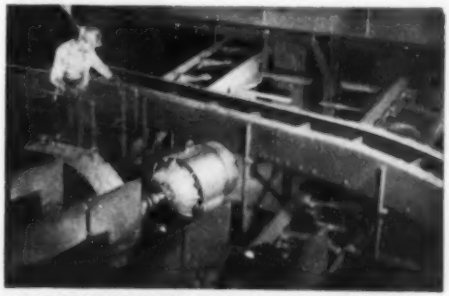
TIMELY INFORMATION AVAILABLE

If you are concerned with training manpower, the new G-E Motor Selection and Application Course, including nine strip films, is a unique and valuable aid. A sample copy of the "Instructor's Manual" (GEZ-310), which outlines the course, may be obtained on request.

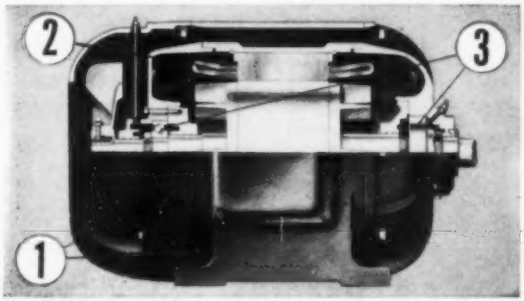
Also available is a free bulletin on "How to Maintain Motors and Generators" (GET-1202). Contact your local G-E sales office for any of the above material, or write *Section 752-12, General Electric Co., Schenectady 5, N. Y.*



FOOD PLANTS on "continuous process" operation depend on Tri-Clad motors to avoid costly shut-downs. Totally-enclosed, non-ventilated Tri-Clad gear-motor above drives a repulper in a sugar refinery.



MINING INDUSTRIES know Tri-Clad motors can take abuse, don't twist out of line and are corrosion-resistant. This totally-enclosed, fan-cooled, Tri-Clad motor runs a coal conveyor.

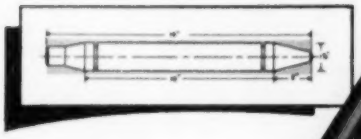


UNINTERRUPTED SERVICE under tough conditions is assured by many outstanding features of Tri-Clad totally-enclosed motors, for example: 1 rigid, cast-iron end shields and frame; 2 Formex* windings which resist oil, heat, shock, moisture, abrasion; 3 completely enclosed bearings that will last longer because provision is made for relubrication if necessary.

*Reg. trademark of General Electric Co.

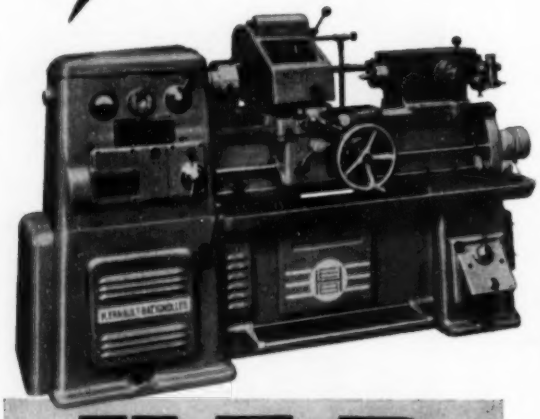
METAL WORKING FIELD likes Tri-Clad motors because they're easy to mount in any position, rigid and smooth running, and *can be relubricated if operating conditions warrant — without disassembly!* Six 7½-hp TEFC Tri-Clad motors run machine above which polishes 500 to 1000 metal coffee-makers per hour!

Did YOU See This Shaft Finish-Turned in Less Than Two Minutes at The ASTE Show?



HIGH SPEED HYDRAULIC COPYING LATHES

IMMEDIATE DELIVERY NO PRIORITY REQUIRED



The H.E.B. copy-turns shafts like this from SAE 3150 solid bar stock 1⅝" diameter *with almost breath-taking rapidity* . . . with far greater accuracy and better finish than on multi-tool lathes. Boosts production as much as 300%.

It's the H.E.B. Copying Lathe's patented tracer device *built into* this ruggedly constructed precision machine that produces such industrial magic . . . Reduces rejects because operation is automatic. Economical for short runs, too, due to short setting time of but 10 to 20 minutes.

The H.E.B. (OP Models) copy-turn all types of shafts and other circular components. Multiple diameters, tapers, chamfers, radii, right-angled shoulders, etc., may be machined internally or externally within ±.0004" at spindle speeds of 50-3600 RPM, utilizing carbide tools at maximum capacity. 20 HP is available for heavy cuts.

GT Models are available with rotating pattern, designed for copying an infinite variety of irregular, non-circular work.

More than a thousand of these modern copying lathes are now in use throughout the world . . . designed and built in France by H. Ernault Batignolles, machine tool manufacturers for almost a hundred years!

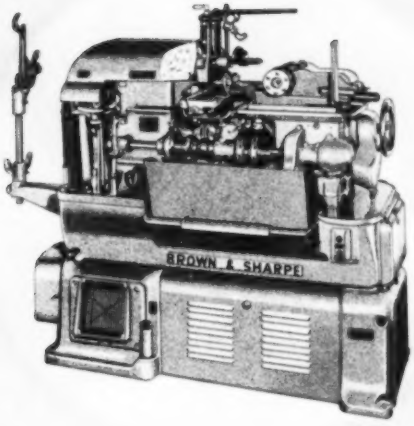
Write us now for complete catalog or demonstration.

H·E·B

"THE WAY TO TURN"

H.E.B. MACHINE TOOLS, INC.
341 MADISON AVENUE
NEW YORK 17, N. Y.

COPYING LATHES • ENGINE LATHES WITH COPYING ATTACHMENTS • TOOL ROOM LATHES • CARBIDE TOOL GRINDERS

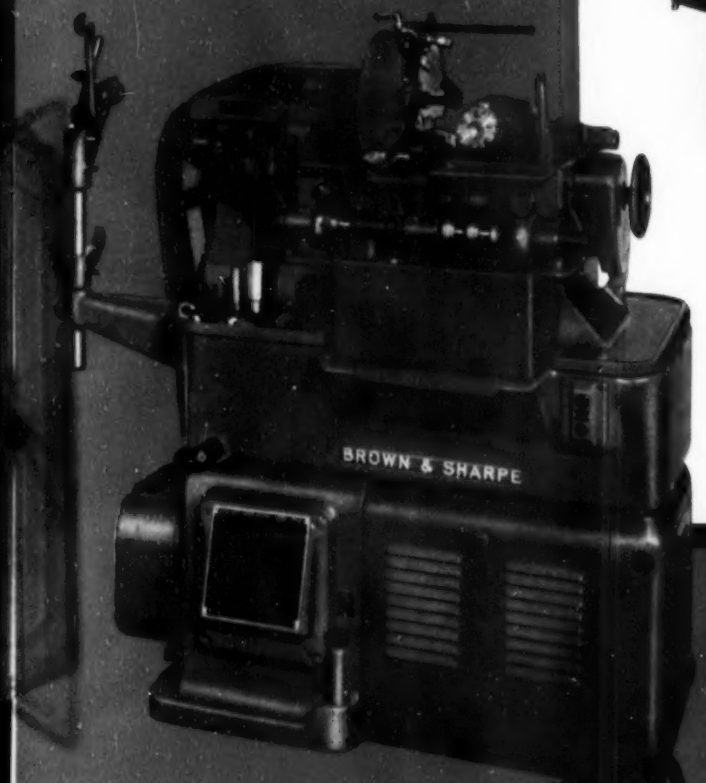


B·S

PRODUCTIONEERED

Equipment for Screw Machine Departments

With the growing importance of speeded-up contracts today, Brown & Sharpe Screw Machines and Equipment can provide major help in stepping up the production of small parts that require high precision. Through incorporation of many time-saving features, these modern products have been basically designed—*"Productioneered"*—to cut production time to the bone, to produce the maximum of precision work with the minimum of skilled supervision.

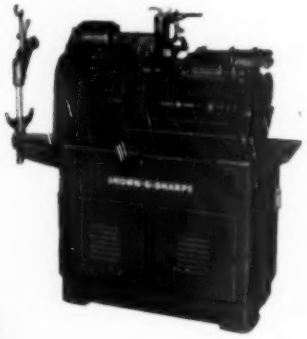


PRODUCTIONEERED

for higher speed,
closer limits, finer finish

PRODUCTIONEERED

to make precision screws faster,
at lower cost



BROWN & SHARPE AUTOMATIC SCREW THREADING MACHINE

This machine not only saves time and cuts costs of making precision screws, but frees your regular automatics for other work. Also handles many jobs involving forming and cutting-off, such as pins and bushings. Exceptional production efficiency because of overlapping operations—forming, threading, slotting and partially cutting-off simultaneously. Capacity $\frac{1}{8}$" dia.

Brown & Sharpe

AUTOMATIC SCREW MACHINES

Nos. 00G (illustrated), **0G and 2G**

With 196 two-speed combinations and wide range of high-to-low speed ratios, these machines can be run at the most efficient speed for each operation . . . and for a wide variety of materials. Positive chain drive to the spindle delivers full power at all speeds and rapid, automatic idle movements add to high efficiency. Also made in Automatic Cutting-Off type for manufacture of long parts requiring only forming and cutting off.

BS

PRODUCTIONEERED

for high output staff and pinion work

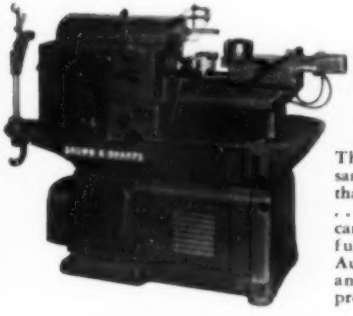
BROWN & SHARPE AUTOMATIC PINION TURNING MACHINE

This modern single-point turning machine fulfills close tolerances and fine-finish requirements of precision assemblies such as clocks, timers, etc. Highly simplified advanced features eliminate need for expert pinion turning specialists to operate. Capacity up to ¼" dia.

BS

PRODUCTIONEERED

for more profitable short runs and second operations



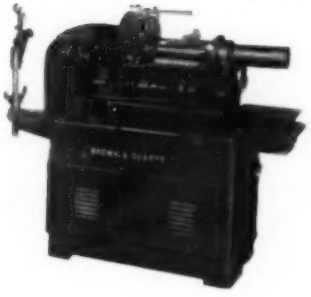
NEW BROWN & SHARPE HAND SCREW MACHINES
Nos. 00, 0 (illustrated) and 2

These machines perform the same operations on short runs that automatics do on long runs . . . but set up faster without cams or timing for automatic functions. Supplement your Automatics and make short runs and second operation work profitable.

BS

PRODUCTIONEERED

for smooth-end cutting-off in a single operation



BROWN & SHARPE AUTOMATIC CUTTING-OFF MACHINE
Opposed Spindle Type

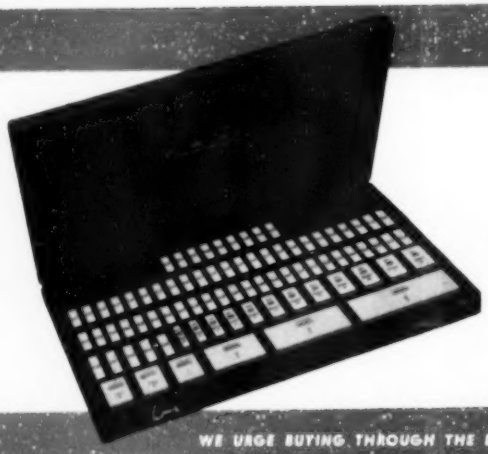
This machine, while basically similar to the Automatic Screw Machine, has an opposed spindle which supports the work during the cutting operations. Suited to fast, economical manufacture of many parts from bar stock . . . without second operations to remove cut-off teats. ⅛" dia. capacity.

PRODUCTIONEERED

for peak output with highest accuracy

BROWN & SHARPE SCREW MACHINE TOOLS

Brown & Sharpe offers a complete line of screw machine tools—all strong, durable and easy to adjust. Engineered to boost production of accurate work, with good finish, at low cost.



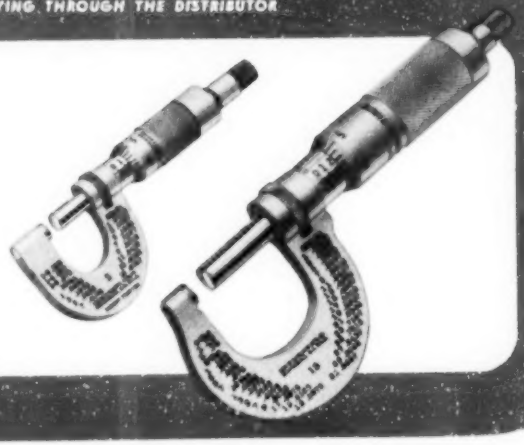
JOHANSSON GAGE BLOCKS

With today's emphasis on increased production all down the line, your surest way to get sustained high precision is by the regular checking of your measurement standards with Jo-Blocks. They are your surest, most convenient protection against costly rejects and time lost through measurement and gage inaccuracies. 3 guaranteed accuracy standards: ±.000002", ±.000004" and ±.000008" per inch.

WE URGE BUYING THROUGH THE DISTRIBUTOR

NEW BROWN & SHARPE MICROMETERS

These micrometers have many exclusive new features. Greater wear protection is provided by improvements such as carbide measuring surfaces, one-piece hardened stainless steel spindle and ground threads, dull chrome finish, etc. Simple adjustments permit easy maintenance of accuracy throughout long service life.



WRITE FOR COMPLETE INFORMATION ON ANY OF THE BROWN & SHARPE PRODUCTS LISTED BELOW

Brown & Sharpe

Milling Machines • Grinding Machines • Screw Machines • Cutters
Machine Tool Accessories • Machinists' Tools • Johansson Gage Blocks
Electronic Measuring Equipment • Permanent Magnet Chucks • Pumps

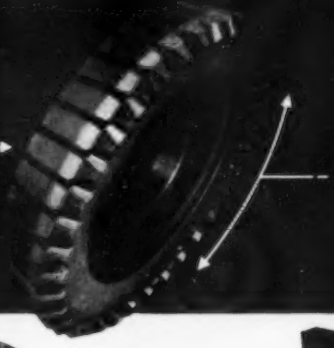
BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U. S. A.

PRINTED IN U.S.A.

PIONEERS IN THE ART OF DESIGNING AND PRODUCING CEMENTED CARBIDE TOOLS

with WESSON TOOLS
and WESSONMETAL

SOLID OR CARBIDE
TIPPED BLADES
INTERCHANGEABLE



FINER PITCH
MEANS
MORE BLADES,
LESS SHOCK
LESS CHIP LOAD

WESSON TOOLS are designed to take full advantage of solid carbide. Wesson Holders—the multicut, lathe tool, the Rigidcut face mill and other Wesson tools give you more production for less money.

WESSONMETAL produced in uniform standard grades and several special grades, is fast becoming the leading cemented carbide. Write today for complete information on Wessonmetal and Wesson Tools.

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ARMSTRONG
TOOL HOLDERS

Equip with
ARMSTRONG TOOL HOLDERS
for Defense production

A change over to new products, starts in the tool room and the die shop . . . starts with ARMSTRONG TOOL HOLDERS. In preparing for defense orders, the logical first step is to check your stock of ARMSTRONG TOOL HOLDERS. With the correct types for every operation, and the correct sizes for each lathe, planer, slotter and shaper, you will be able to start work on a moments notice.

ARMSTRONG TOOL HOLDERS reduce "tooling-up" to the selection of a cutter and tightening of a set screw. They permit operation at higher speeds, and heavier feeds than are customary—they enable you to produce more pieces per hour, per man, per machine.

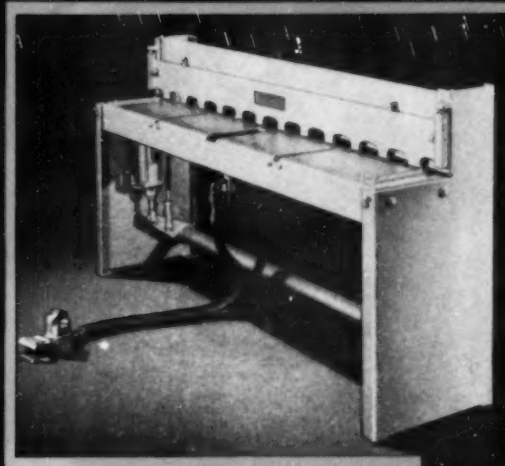
Produced by modern methods, in a specially-built tool plant, they are the lowest cost tooling you can buy. And, they are as available as your telephone for they are carried in stock by your local supply house.

Use ARMSTRONG TOOL HOLDERS wherever possible for lower tool cost, saving in High Speed Steel, increased output and greater profit. *Write for Catalog*

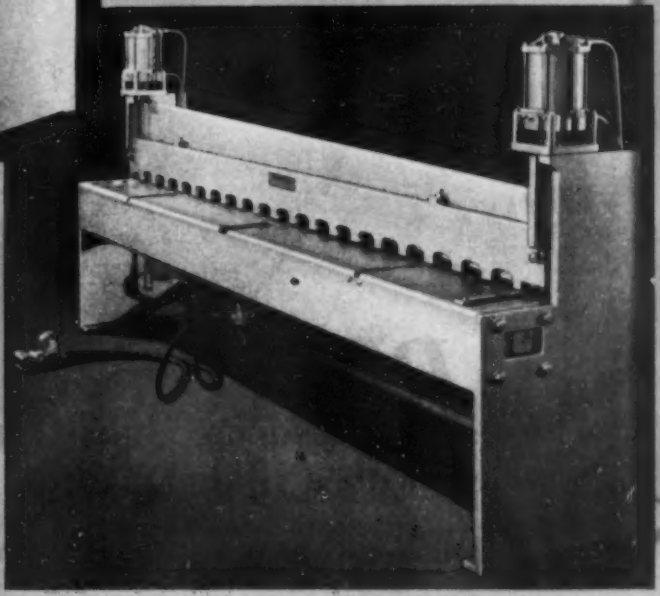
ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

Announcing NIAGARA

AIR POWER SQUARING SHEARS *for the Thrifty Sheet Metal Shop*



Capacity 16 Gage—3 ft., 4 ft. and 6 ft. Cutting Lengths.



Patented and Patents Pending

Capacity 18 Gage—8 ft. and 10 ft. Cutting Lengths.

FEATURES

- Low Initial Cost . . . Simplified Construction
- Cutting lengths ranging from 3 to 10 feet
- Capacity 16 and 18 gage mild steel
- Economical Operation
- Operates from average shop air line or a small compressor
- Flexible hose to foot treadle permits operator to trip shear from any convenient location
- One man effortless operation
- Accurate Cuts
- Unbreakable all steel construction
- Adjustable laminated plastic ways
- Automatic holddown
- Micrometer and quick acting back gages

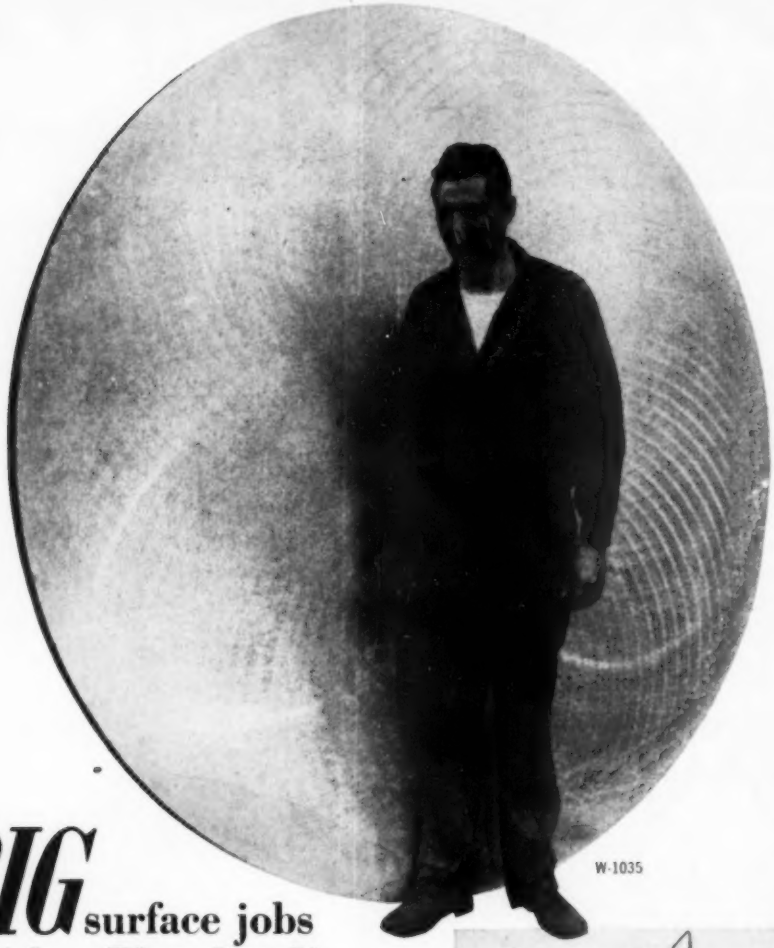
WRITE FOR NEW BULLETIN 87

NIAGARA MACHINE AND TOOL WORKS, BUFFALO 11, N. Y.

America's Most Complete Line of Presses, Shears, Machines and Tools for Sheet Metal Work

DISTRICT OFFICES: NEW YORK, CLEVELAND, DETROIT, PHILADELPHIA

Dealers in principal U. S. cities and major foreign countries

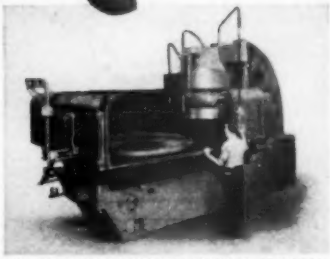


W-1035

Those *BIG* surface jobs are easy with a Blanchard!

No other machining method can match the speed, economy and quality of Blanchard Grinding on large flat surface work. This 88" diameter, cast iron plate, for example, was rough ground in 3½ hours, floor to floor. *¼" of stock was removed from one side —a total of 1520 cu. in.—380 pounds!*

After normalizing, finish grinding on the Blanchard produced a water-tight joint, with a Blanchard ground mating service, each being flat within .001". Why try to machine your large work with time-consuming methods, when Blanchard Grinding offers such speed, economy and quality with surprisingly low wheel costs?



NO. 42-72-84 BLANCHARD SURFACE GRINDERS

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

BULLARD

MANUFACTURERS OF MACHINE TOOLS

White Fish Bay, Lake Superior and ice bound ore carriers — U. S. Steel Photo

The Invisible Background of Industrial Progress

Transportation of ore from the mines to basic industry is a large and important operation that is relatively unknown to many of us in view of the usual availability of the most common finished consumer products. The ore carriers in the illustration, although temporarily ice bound and awaiting an ice breaker to cut a path to open water, depict the scope of operations necessary for the transportation of iron ore from the mines through the Great Lakes to the blast furnaces. . .

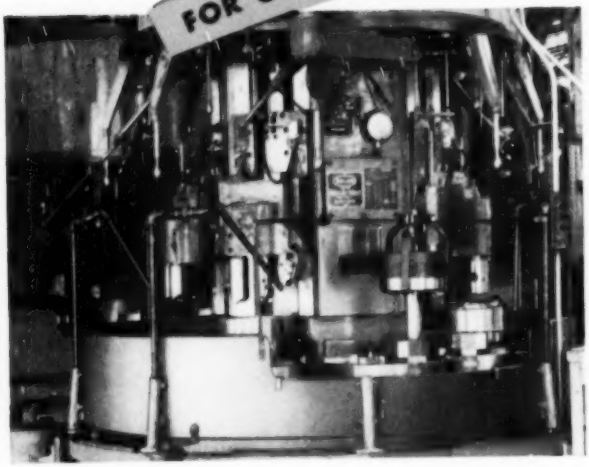
As machine tool builders we are proud to have contributed a part in the building and maintenance of these huge ore carriers as well as the cranes, conveyors and numerous other dock and loading facilities necessary to their operation. . .

★ *Modern Machine Tools* and large scale operations make possible constant cost reductions, enabling the mines, transportation and the manufacturing industries to produce more and better products at greater savings, creating a higher standard of living for the American people.

THE BULLARD COMPANY
BRIDGEPORT 2
CONNECTICUT

★ *For greater manufacturing economy REFER to next page*

BULLARD MACHINE TOOLS
FOR GREATER MANUFACTURING ECONOMY



The Mult-Au-Matic Method of machining work originated back in 1914.

This method, whether it is with 4, 6, 8, 12, or 16 spindles, has a basic time element for Manufacturing Economy. The time to produce a finished piece of work is equal to the time for the longest operation plus a few seconds for indexing.

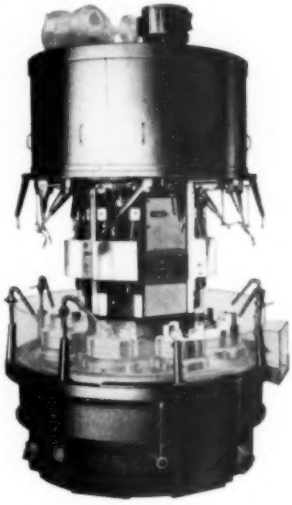
Mult-Au-Matics are considered now, more than ever before, as Key Units for repetitive machining of work where Accuracy and Fast Economical Production are the requirements.

Iron ore transported from the mines, and processed, provides the base material for iron castings, steel forgings and bar steel so essential to our Economic World of today.

From these forms thousands of different pieces of varying design are produced by industry on Machine Tools.

Mult-Au-Matic work is not confined to any one field of Industry but extends over a wide range of products.

The Automotive Industries have always been the largest users of these machines. However, the flexibility of tooling fits Mult-Au-Matics for practical use in the manufacture of fractional horsepower electric motors, tractors, mechanical farm equipment, power lawn mowers, outboard motors and nearly any class of work where boring, turning, facing, drilling and reaming operations are called for.



For Manufacturing Economy use Mult-Au-Matics. Built in 8-, 12-, 16-, and 34-inch sizes with 4, 6, 8, 12, or 16 spindles according to the specific model.

BULLARD

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

That's All the Cleaning an Allis-Chalmers TEFC Motor Ever Needs

MAINTENANCE COSTS ARE LOW for users of Allis-Chalmers Totally-Enclosed, Fan-Cooled Motors. They are easy to clean because even the stickiest dirt can be wiped or blown off without dismantling the motor or even stopping it. They seldom require cleaning because cooling air flows over the *outside* of the motor. There are no external concealed air passages to clog up and cause over-heating. You get better operational continuity, lower maintenance.

Bearings Save Maintenance, Too

Double-shielded ball bearings require no regular maintenance under most normal operating conditions. Yet if difficult service makes re-lubrication desirable, it can be done without dismantling the motor or bearings. Rigid cast iron frame and stiff end brackets maintain bearing alignment . . . assure maximum bearing life.

A-3639

Texrope and Vari-Pitch are Allis-Chalmers Trademarks.

ALLIS-CHALMERS

Get The Full Story Now

Your Allis-Chalmers Authorized Dealer or District Office can give you complete information on Allis-Chalmers Totally-Enclosed, Fan-Cooled Motors and how they can save you money. Call one of them today or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B7225.

Sold . . Applied . . Serviced . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types from ½ in. to 72 in. discharge and up.

STANDARD Gages

ALL THESE... and MANY MORE

For doing your job better . . . easier!

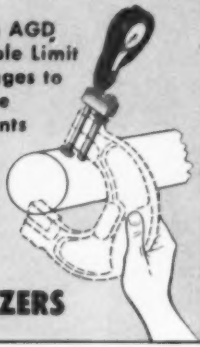
7 Sizes
Cover Range
⅜"-12⅛"

DIAL BORE GAGES

Various Sizes and Graduations

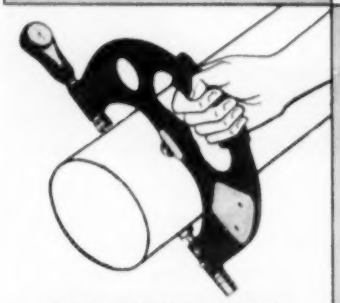
Shockproof

DIAL INDICATORS



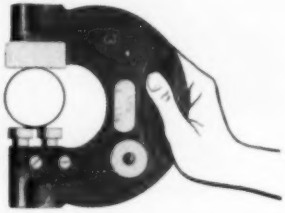
Converts AGD Adjustable Limit Snap Gages to Dial Type Instruments

DIALIZERS



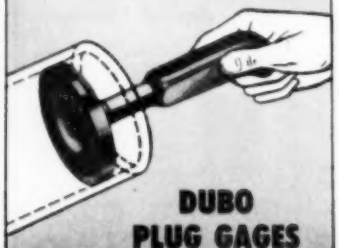
DIAL SNAP GAGES

DIAL COMPARATORS

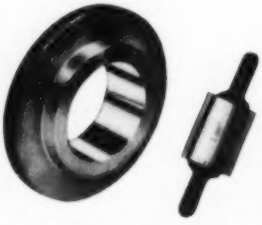


ADJUSTABLE LIMIT SNAP GAGES

Light in Weight
Sensitive, Definite Check



DUBO PLUG GAGES

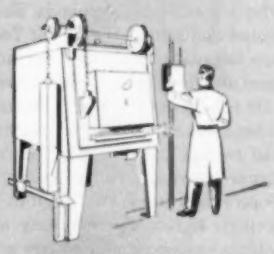


MASTER SETTING GAGES

Write for New Catalog B

STANDARD GAGE CO., Inc., *Poughkeepsie, N.Y.*

for toolroom or high production... quality HEAT-TREATING calls for a WESTINGHOUSE FURNACE...



Typical Westinghouse Box Furnace used in toolroom heat-treating for hardening. Other Westinghouse Furnaces available for carburizing, drawing, ageing, annealing, austempering, brazing, carbonitriding, martempering, nitriding, preheating, sintering, solution treatment.

There's a Westinghouse furnace to provide the exact answer for every heat-treating application . . . gas or electric. For toolroom or for low-to-medium production applications, choose from over fifteen standard types of box furnaces, ten protective atmospheres. J-10373

SEND FOR FREE BOOK...

YOU CAN BE SURE... IF IT'S Westinghouse

HEAT-TREATING FURNACES

Westinghouse Electric Corporation,
Industrial Heating Department
Meadville, Pennsylvania

Please send me free booklet, "Westinghouse Furnaces for the Toolroom, Laboratory or Production Line"

Name _____

Firm _____

Title _____

Address _____

They're back in the States again...

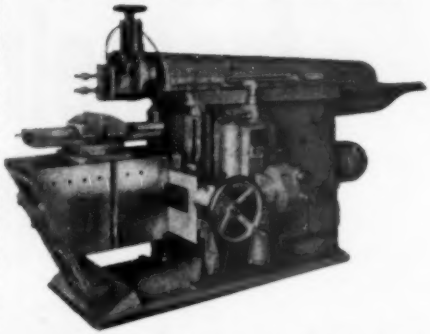
Same KLOPP High-Speed Shapers that cost so little to buy... so little to run, yet turned out so much production!

Klopp Shapers are no strangers to the ways of American mass-production. Many pre-war machines are still on-the-job here at leading metal-working plants, cutting down production costs and stepping up output to keep pace with today's accelerated demands. Several models were demonstrated and sold at the recent Tool Engineers Show in Chicago, because machinists were quick to appraise the unusual speed and flexibility of these lower-priced shapers.

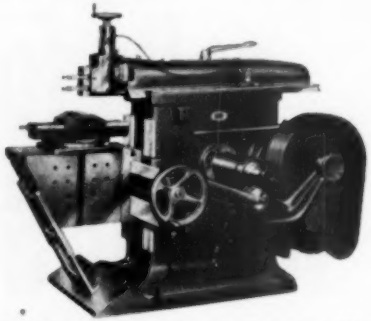
On the Klopp machine, awkward-to-handle, bulky workpieces are easily accessible and simple to set up—because the *head travels to the work*. They're built for high-speed, by Europe's largest manufacturer of shaping machines – at Klopp's fully integrated plant in West Germany—where the complete machines, including all their components from castings to electric motors, are produced.

Write for names of prominent Klopp users. And ask us to quote on your requirements.

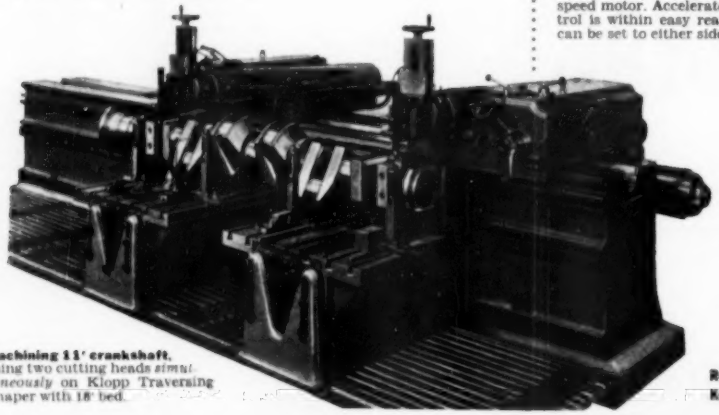
15 Different Models for Immediate Delivery



4 FULLY HYDRAULIC MODELS—stroke lengths from 26" to 39½". Infinitely variable ram speeds with quick return and minimum power consumption. Central operator control panel. Tool holder with graduated scale swivels 45° to either side. Self-acting downfeed of tool slide. Automatic tool lifting device available.



4 MECHANICAL SHAPERS—stroke lengths from 11⅝" to 26⅝". Six rates of speeds with normal motor, 12 with two-speed motor. Accelerated return motion. Single lever control is within easy reach of operator. Swivel work table can be set to either side at an angle up to 90°.



Machining 11' crankshaft, using two cutting heads *simultaneously* on Klopp Traversing Shaper with 18' bed.

7 TRAVERSING TYPES—stroke lengths up to 39½"—handle workpieces 6' to 18'. Larger models have two cutting heads which can be brought to the work. Using single point tool, traversing type is capable of faster, more economical production of work usually machined on a planer, plus bulky pieces beyond normal planer capacity.

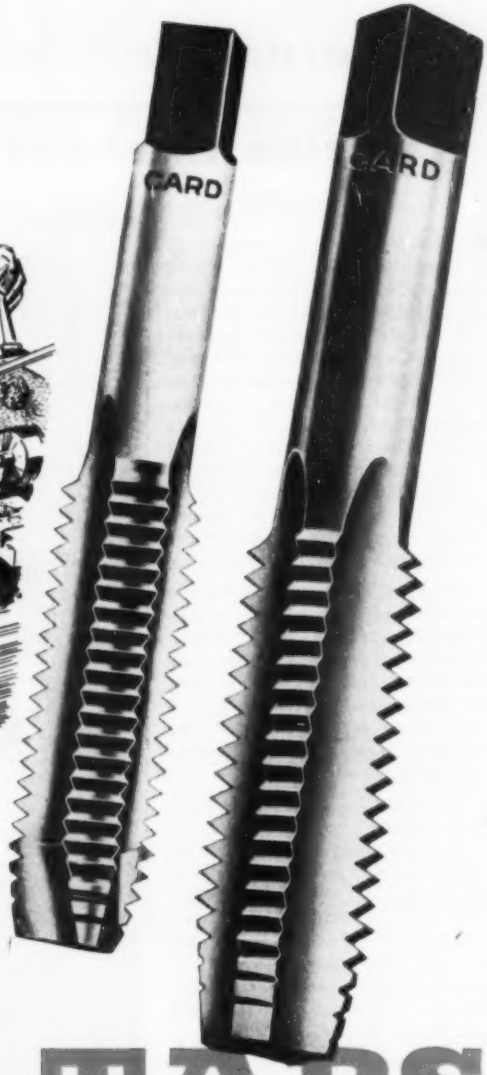
Replacement parts will be available at Kurt Orban Service Center in Cleveland.

KURT ORBAN

COMPANY, INC.

205 East 42nd St., New York 17 • 4220 Prospect Ave., Cleveland 3 • 19450 James Couzens Highway, Detroit

Canadian sales by European Machinery Ltd., 11 King St. West, Toronto, Canada



YOU'RE SURE

OF TRUE "SPECS"

WHEN YOU ORDER

CARD TAPS

All Card taps are given many rigid factory-inspections. They are manufactured in carbon steel and in high-speed steel – cut thread, commercial ground or precision ground. S. W. Card Manufacturing Company, Mansfield, Mass. Division of Union Twist Drill Co.

ASK YOUR CARD DISTRIBUTOR FOR COMPLETE DETAILS

The CARD Quality

TAPS

Also makers of DIES • SCREW PLATES • DIE STOCKS
TAP WRENCHES

COMFORT "FLIES HIGH"

BORING TIME "NOSE-DIVES"

When Fosdick goes to work for Fairchild

■ Trans-Atlantic airline passengers fly in safety high above North Atlantic storms . . . breathe in "living-room" comfort at 25,000 feet — thanks to the cabin pressurizer made by Fairchild Engine and Airplane Corporation. Mass production of the precision magnesium housing unit for commercial and military cabin superchargers demanded speed and unerring accuracy. That's why Fairchild installed Fosdick Automatic Positioning Machines for drilling, facing and boring 31/32" holes to a depth of 1.670". Result? Accuracy to ± .0001" . . . *boring time slashed 40% over previous methods.*

"And equally important," says Assistant Plant Manager C. E. Luhman of Fairchild's Stratos Division, "is the phenomenal flexibility of the Fosdick Automatic Positioning Machine. It's simple to interrupt production — run through 5 or 6 pieces for an experimental unit — and then return to production with an absolute minimum of down time."

If, like Fairchild, *you* need exact reproduction of drilled, bored and tapped parts — plus quick changeover from one job to another — with holes located to tolerances as close as ± .0001" — investigate the Fosdick Automatic Positioning Machine today. It will actually pay for itself many times over through savings in man hours, set-up time, materials and jig storage space. Call your Fosdick Distributor today or write for Bulletin APA.

Fairchild's Stratos Division slashed boring time 40% with this Fosdick Automatic Positioning Machine. A touch of the button positions the work electrically for each new hole to ± .0001" center line tolerance — in seconds! Costly jigs have been replaced by two ⅝" square duplicating bars drilled quickly for the job and stored easily.

FOSDICK

RADIAL DRILLS
SENSITIVE AND UPRIGHT DRILLS

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

JIG BORERS
AUTOMATIC POSITIONING MACHINES
SENSITIVE RADIAL DRILLS

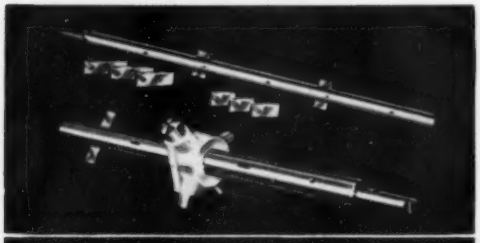
INCREASE YOUR PRODUCTION ON YOUR PRESENT EQUIPMENT

with Davis complete tooling service

Davis "Complete Tooling Service" is a world-wide sales and service organization that offers you a full line of standard boring tools (capacity — any diameter from ¾" to 50") . . . plus design and construction of special tools to meet your particular requirements.

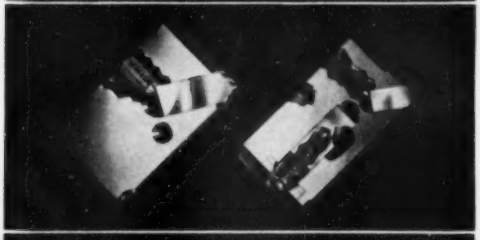
Davis maintains a large staff of design engineers and field servicemen, to aid you in every phase of efficient tool selection.

Now you can standardize your whole shop on one complete line of modern tools . . . count on one dependable source of supply and engineering help . . . share in the very latest developments in tool design. You can realize all the advantages of the Davis "Complete Tooling Service" . . . increased production, lower costs and greater flexibility of your equipment.



To meet individual needs, Davis has a wide range of plain and block type line bars for specific applications. Case hardened bars are furnished when cutting loads are heavy and wear resistant qualities are needed for high production. Cutter blocks are quickly inserted in tool slots and locked in accurate position with a taper lock screw.

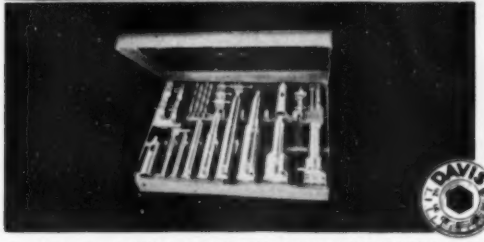
Also available for mounting on Davis line boring bars are other micrometer adjustable cutter blocks and boring heads capable of obtaining bores up to 50" diameter.



Davis regular single and two-cutter adjustable block type cutters are ideal for general purpose boring where rigidity and a wide range of cutter adjustments are the main requisites. Boring range ¾" to 17".

Multiple cutter types, although special in design, are in most cases interchangeable with regular blocks, and can be furnished with two or more sets of cutters for boring, counterboring and facing. These are built to suit requirements.

Sturdy Davis "clamped-on" tipped carbide cutters and massive holders make it practical to use maximum planer feeds with minimum strain upon the tip. Holders are made in either right or left hand and will accommodate different style tips which means less holders are required.



Davis stub boring tools speed up boring operations on vertical and horizontal boring machines. They are available in sets consisting of precision made stub boring bars that are accurate to .0001" fine adjustment. Range from ½" to 7" diameter.

DAVIS BORING TOOL DIVISION

GIDDINGS & LEWIS MACHINE TOOL COMPANY • Fond du Lac, Wis.

Manufacturers of: **TABLE, FLOOR AND PLANER TYPE HORIZONTAL BORING, DRILLING AND MILLING MACHINES • VERTICAL BORING AND TURNING MILLS • DOUBLE HOUSING AND OPEN SIDE PLANERS AND PLANER TYPE MILLING MACHINES • COMPLETE TOOLING SERVICE**

Do you really know you couldn't do

Only **CARBO**

IKAGL

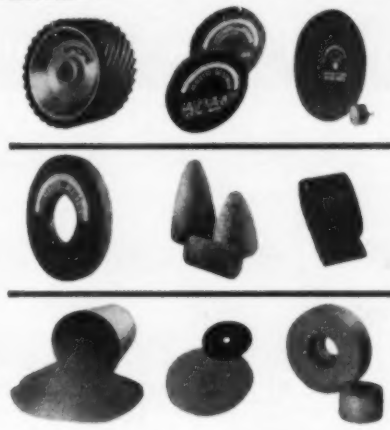
"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, New York

it faster with an abrasive DISC?

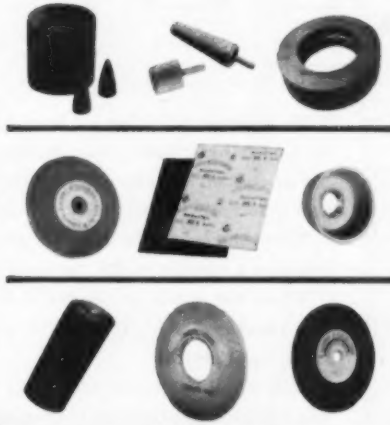
A healthy skepticism is the profitable approach for you to take, nowadays, to every abrasive operation in your shop. The difference between a bad and a good profit factor can often be a new improvement in grinding, and new developments in this field are piling up daily under the crucial necessity of cutting costs without cutting corners.

If there's a faster, better way to perform any grinding or polishing operation, your CARBORUNDUM or distributor salesman is one man who's sure to know about it. Through him, and with his unbiased help, you can change your operating methods, if that seems indicated. Or you can change the abrasive you're using. Or both, or neither. The point is...both you and he are operating on *your* side of the desk—primarily for your profit, incidentally for his...not the other way round.

That's what comes of working with the man who represents the only complete line of branded abrasives, unsurpassed in scope, unexcelled in quality. So, today—call in the man from CARBORUNDUM: it's to your profit!



Here are only a few of the 30,000 reasons why you get the RIGHT combination of abrasive and method only from CARBORUNDUM

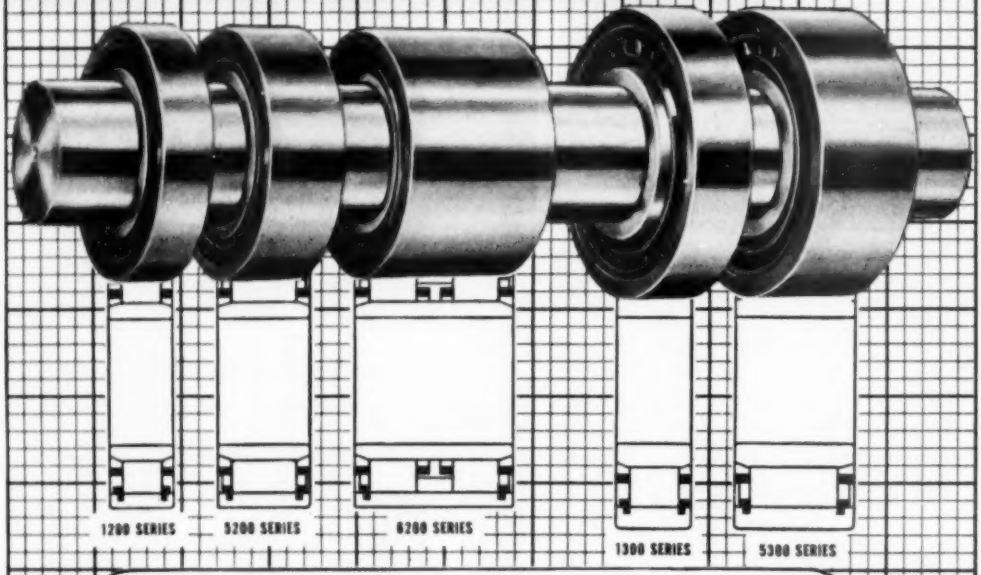


RUNDUM

MARK

offers ALL abrasive products...to give you the proper ONE

HYATT HY-LOADS
Five Types—A Common Shaft



With a large selection of bearing types from which to choose, Hyatt Hy-Loads help make your design job easier.

For instance, here are five Hy-Load Bearings—all different in size and load-carrying capacity, yet all fitting a common shaft.

When the loads are light you can economize in space, cost and weight and use a narrow width bearing of our light, (1200) series.

When the loads are heavy and the outside diameter is limited, you can choose a wide (5200) or duplex width (6200) bearing of this same light series.

And when the loads are heavy and the axial space is not available, you can still provide for increased capacity with the medium (1300 or 5300) series Hy-Load Bearing which has a larger over-all diameter.

These five combinations, available in most standard bearing bore sizes, illustrate just one of the many types and sizes of Hyatt Roller Bearings as shown in Hyatt Hy-Load Catalog #547. For your copy write to Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.

HYATT ROLLER BEARINGS

P.S.

Jones & Lamson Comparators guarantee swift, sure QUALITY CONTROL—*throughout your production lines.* Write for Catalog No. 402. One of our eleven models will fit your needs.

JONES & LAMSON

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

Machine Tool Craftsmen Since 1835

COMPARATOR DIV.
Dept. 710

Jones & Lamson Machine Company
Springfield, Vt., U.S.A., Dept. 710
Please send Comparator Catalog No. 402.

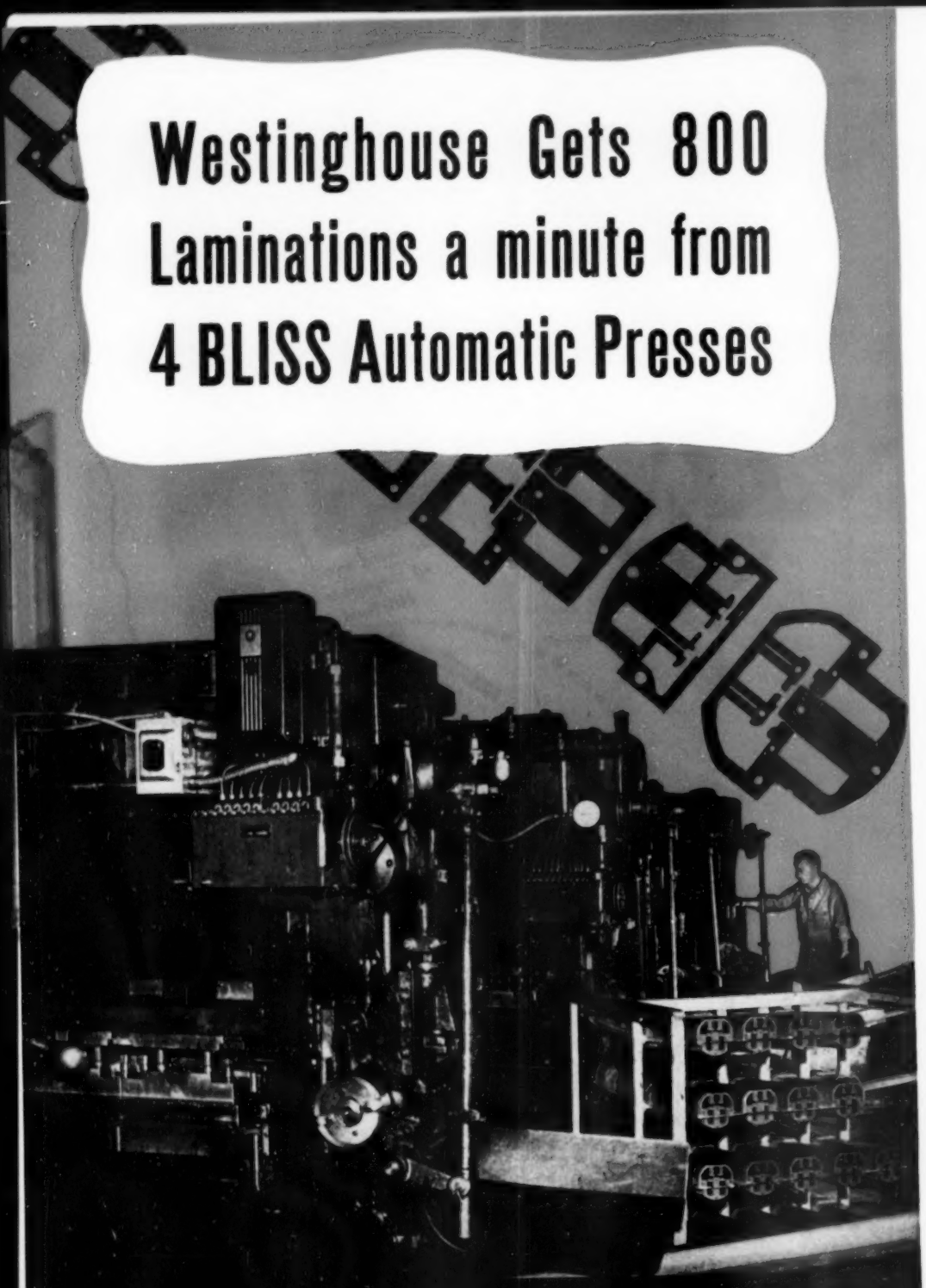
NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ STATE _____

Westinghouse Gets 800 Laminations a minute from 4 BLISS Automatic Presses



Bliss Automatic Lamination line of four No. 645 High-Production Presses, operating at speeds in excess of 200 strokes per minute, produces meter laminations at the Westinghouse, Newark, N. J., plant.

Meter Division at Newark operates battery through two shifts daily

To keep pace with stepped-up meter production, Westinghouse relies on a battery of four Bliss High-Production Presses for a major portion of its lamination stampings.

Production is fully automatic: 0.017 in. silicon steel feeds from a Bliss-built coil cradle, through a double-roll feed, into the Westinghouse-designed six-station die. Stamped laminations stack into a magazine; scrap is pulled through and automatically trimmed...all at a continuous day-in, day-out operating rate of 200 spm.

The first of these four Bliss No. 645 Presses was installed in 1929; the newest has been on the job less than a year. These are but four of 80 Bliss presses on the job at the Westinghouse Meter Division.

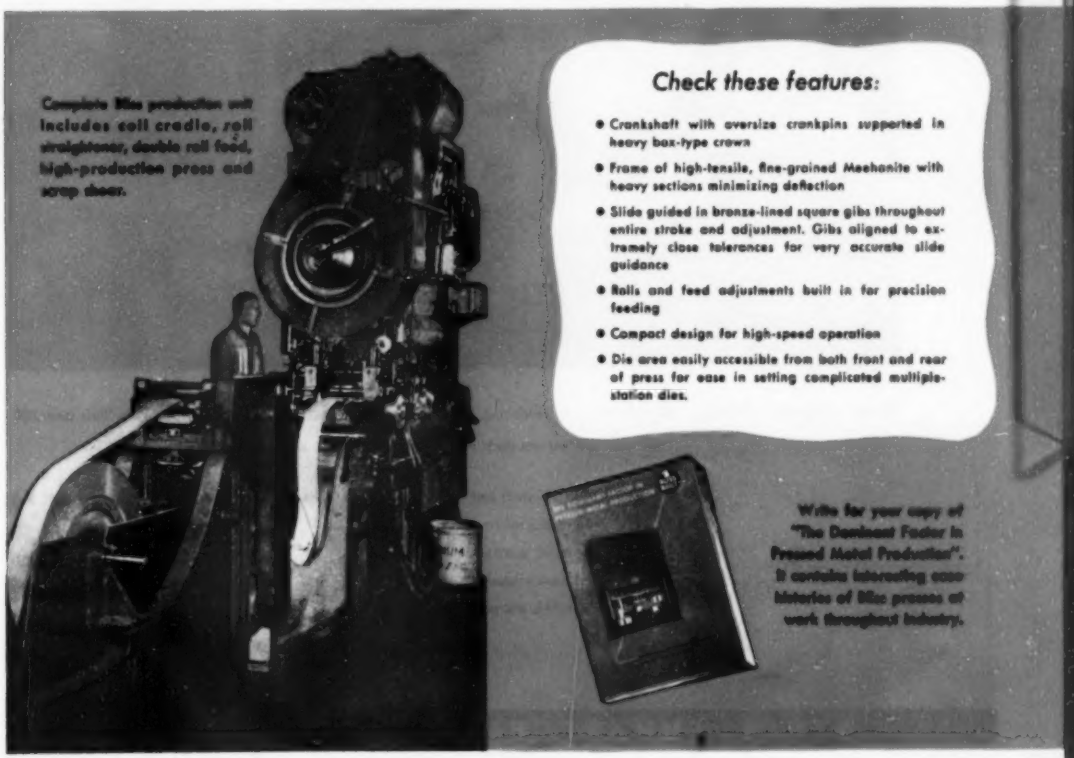
When you consult Bliss engineers, you will find Bliss has the right press for almost every metal-forming operation. That's because Bliss builds the most complete range of pressed-metal machinery available anywhere. To see how Bliss experience has worked for industry, write for "The Dominant Factor," our 32-page brochure.

E. W. BLISS COMPANY, CANTON, OHIO

E. W. Bliss (England) Ltd., Derby, England

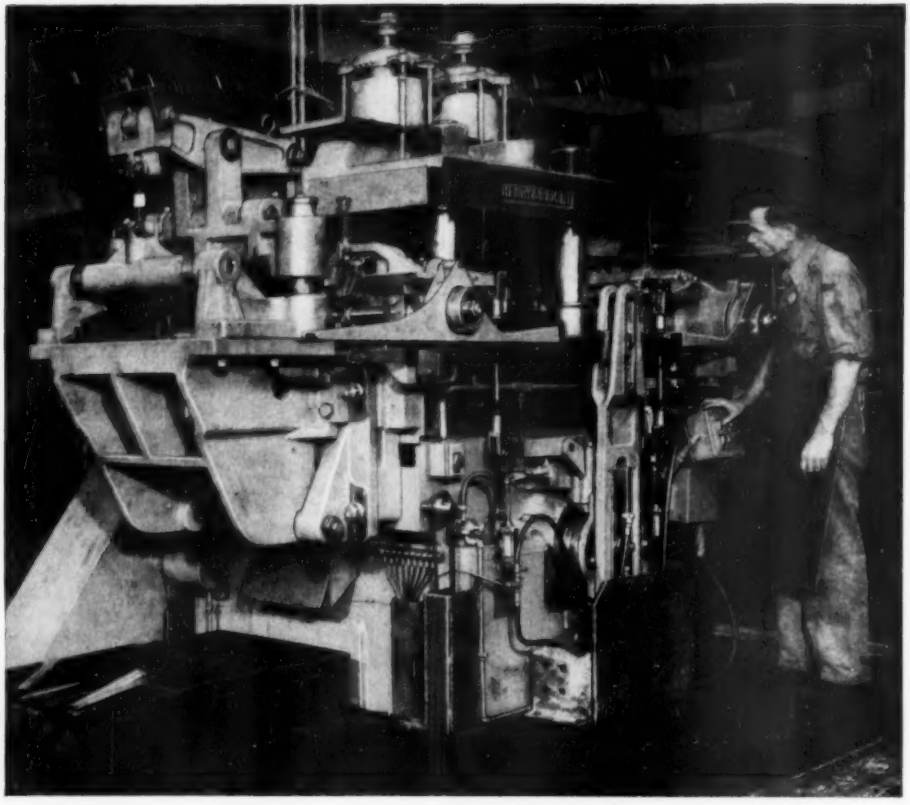
E. W. Bliss Company (Paris), St. Ouen sur Seine, France

Presses, Rolling Mills, Special Machinery


Complete Bliss production unit includes coil cradle, roll straightener, double roll feed, high-production press and scrap shear.
Check these features:
• Crankshaft with oversize crankpins supported in heavy box-type crown
• Frame of high-tensile, fine-grained Meehanite with heavy sections minimizing deflection
• Slide guided in bronze-lined square gibs throughout entire stroke and adjustment. Gibs aligned to extremely close tolerances for very accurate slide guidance
• Rolls and feed adjustments built in for precision feeding
• Compact design for high-speed operation
• Die area easily accessible from both front and rear of press for ease in setting complicated multiple-station dies.
Write for your copy of "The Dominant Factor in Pressed Metal Production". It contains interesting case histories of Bliss presses at work throughout industry.

From a single press for a given job...to a complete press room... It's Bliss!

H & W Dieing Machines



New, Bigger Dieing Machine is producing 4500 pieces per hour for Hart & Cooley Mfg. Co. This new 200-ton machine features basic Henry & Wright design principles:

- Flywheel, crankshaft and connection are below the punchholder instead of above.
- Low center of gravity for high speed with minimum vibration.
- Punch is pulled, not pushed.
- Maximum guiding surface — four post guide for punchholder.
- Upper crosshead takes only the pressure necessary to perform work in die — no crankshaft thrust.

OTHER EMHART PRODUCTS INCLUDE:

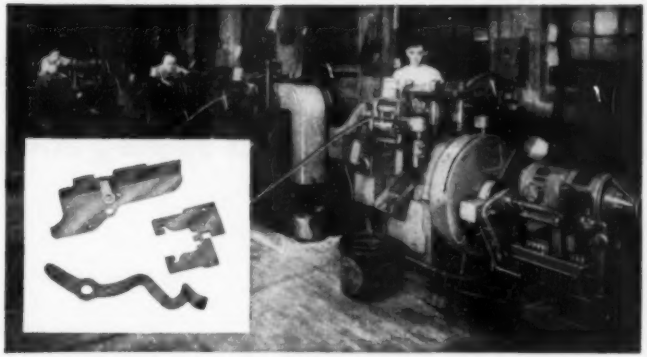
PREMIUM QUALITY STAMPING PRESSES
THE V & O PRESS CO.
Division of Emhart Mfg. Co.
HUDSON, NEW YORK

GLASS MAKING MACHINES
HARTFORD-EMPIRE CO.
Division of Emhart Mfg. Co.
HARTFORD 2, CONNECTICUT

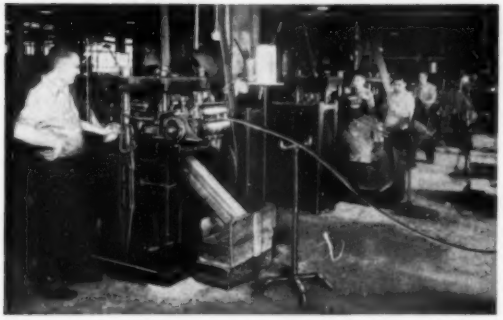
AUTOMATIC PACKAGING EQUIPMENT
STANDARD-KNAPP
Division of Emhart Mfg. Co.
PORTLAND, CONNECTICUT

PLASTIC BOTTLES, RODS, TUBES, SPECIAL SHAPES
PLAX CORPORATION
Subsidiary of Emhart Mfg. Co.
HARTFORD 1, CONNECTICUT

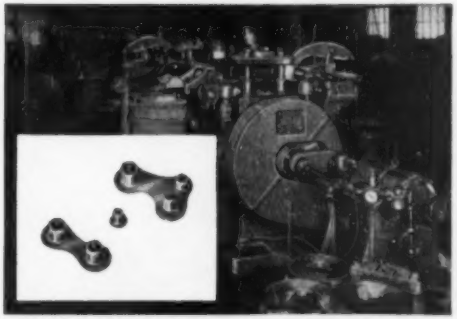
many more pieces at much less cost



Runs of 3,000 to 100,000 are produced on Henry & Wright Dieing Machines at Underwood. About 200 different typewriter parts are made on them, ranging from simple piercing and blanking to stampings produced in multiple station dies including piercing, lancing, extruding, shaving, forming and blanking with each stroke of the machine.



Thousands of Different Parts are produced on Henry & Wright Dieing Machines at the P. & F. Corbin Division of American Hardware Corporation. Variable speed drive on the H & W machines permits Corbin to select stroke rate best suited to the various types of parts.



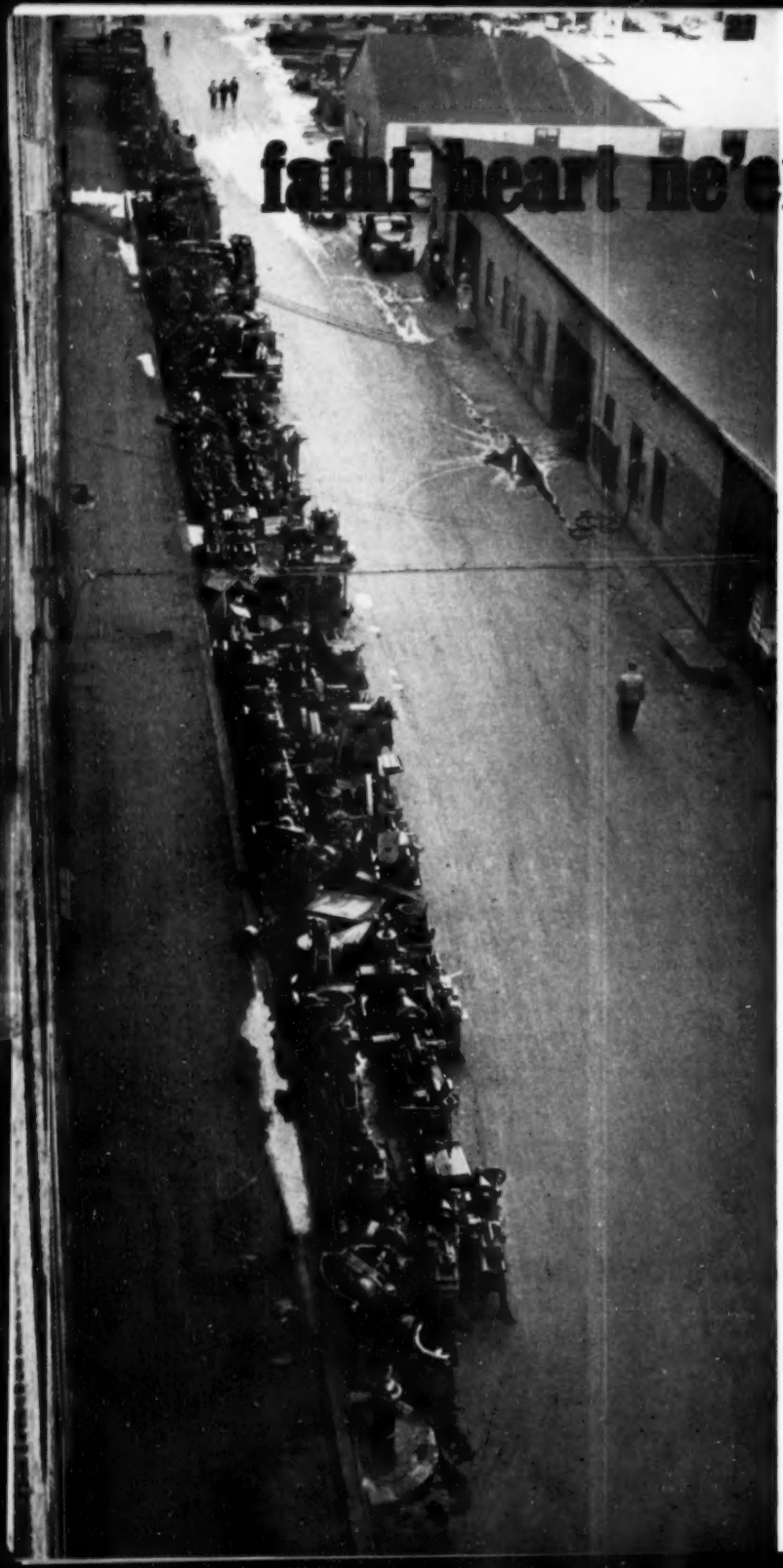
Waterbury Brass Goods Branch, American Brass Company, Waterbury, Conn., has a group of Henry & Wright Dieing Machines for formed metal parts where the quantities involved average one million pieces or more per item. Economical production costs are consistently obtained. Small parts are manufactured five at a time passing through as many as 14 die stations.

Only the best is good enough

FACT PACKED CATALOG

Complete descriptions of all Henry & Wright Dieing Machines. Write: Henry & Wright, 481 Windsor St., Hartford 5, Conn.

HENRY & WRIGHT
Division of Emhart Mfg. Co.



faint heart ne'er saved..

. . . but the *facts* to saving Metal

Vision and planning pay off for Saco-Lowell. Investing more than $1,000,000 a year for five years, this leading textile-machinery manufacturer has retired 1,743 machines, replaced them with 27% fewer, but more productive, new ones. Here, more than 200 discarded machines attest to modernization progress at Saco-Lowell.

THIS IS A GOOD PLACE

. . . $1,000,000,000 a year

on *how* to do it are well on the way

working *more* than this in machining costs alone

In business, nothing builds courage and vision like *facts*. And no group of men in industry are better supplied with the facts on how to lower costs and increase efficiency than the production executives who manufacture America's vast array of metal products.

These facts come to them in the pages of AMERICAN MACHINIST . . . a magazine whose great editorial power builds superior advertising values for you, and for every advertiser who sells to the giant Metalworking INDUSTRY.

A good example of this editorial power is AMERICAN MACHINIST's reporting on the vital subjects of machinery replacement and a wider adoption of high-speed machining:

In late 1949 . . . after completing the most extensive editorial research ever undertaken in the metalworking field*. . . AMERICAN MACHINIST gave Metalworking the startling facts about the obsolescence of this industry's production facilities . . . with 42% of its 3,000,000 major production machines 10 or more years old.

In more than 60 brilliant articles and special reports since late 1949, AMERICAN MACHINIST has printed the facts on what machine-tool replacement, and a full utilization of the tremendously increased machining speeds of which modern machine tools are capable, could mean in lowering production costs and boosting output dramatically.

Machine-tool manufacturers will tell you that the editorial pages of AMERICAN MACHINIST have been a major force behind Metalworking's spectacular drive to replace old machines with new.

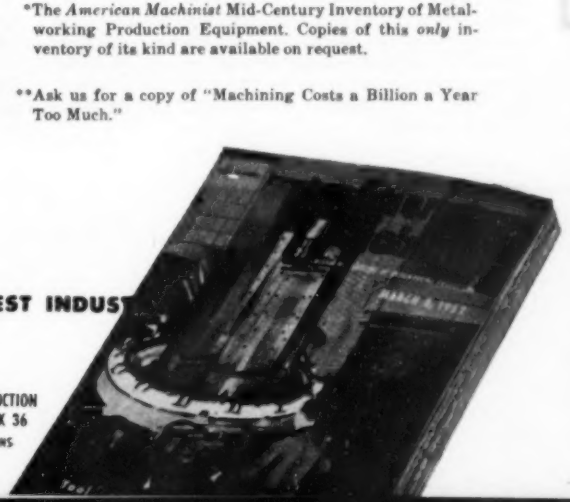
Metalworking's production executives will tell you that AMERICAN MACHINIST has spurred them to try . . . and to adopt increasingly . . . the high-speed machining techniques which can easily cut $1,000,000,000 a year from this industry's present machining costs alone.**

And over 600 advertisers will tell you that the big, and highly responsive, readership its editorial power attracts has made AMERICAN MACHINIST a great advertising force in selling to America's biggest industry.

Thousands more metalworking men subscribe to AMERICAN MACHINIST than to any other metalworking magazine. Advertisers invest more dollars in its pages than in any other metalworking publication. The advertising values its editorial vitality generates will sell *your* products at lower costs. Ask our representative in any McGraw-Hill office for *all* the reasons why.

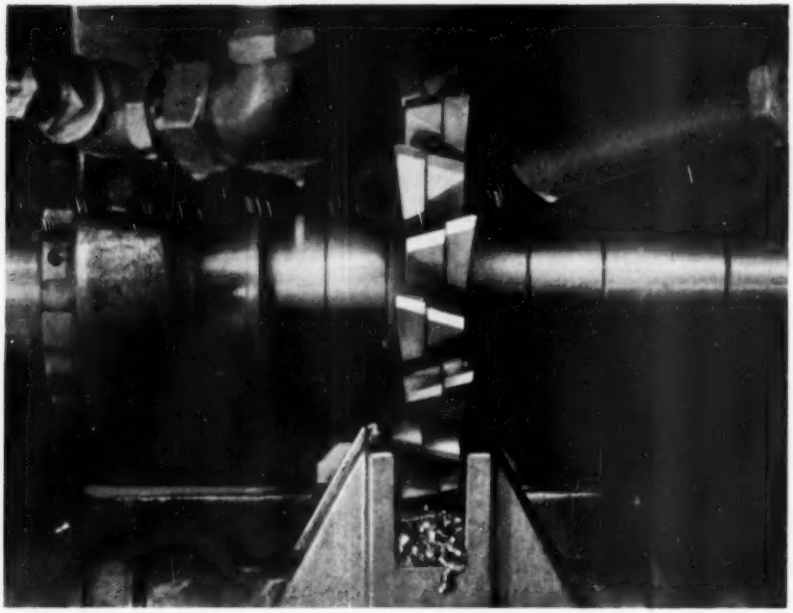
*The *American Machinist* Mid-Century Inventory of Metalworking Production Equipment. Copies of this *only* inventory of its kind are available on request.

**Ask us for a copy of "Machining Costs a Billion a Year Too Much."



TO DO BUSINESS WITH AMERICA'S BIGGEST INDUST

THE McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION
McGRAW-HILL BUILDING, NEW YORK 36
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS AND THE ASSOCIATED BUSINESS PUBLICATIONS



DEEP SLOTTING *improved* with B-C Cutter Design

Barber-Colman Cutter Engineers have developed and patented* an Interlocking Staggered Tooth Cutter which provides greater efficiency for deep slotting operations. Its advantages have been proven through several years of actual field service, and all applications have shown a marked increase in efficiency over any other design. These cutters reduce tooth breakage, increase tool life and permit the use of greater feeds and speeds. They work equally well in steel or soft nonferrous materials, and are essential for operations where the depth of cut exceeds the width of cutting face.

*Patent No. 2,250,662

The outstanding patented feature is the arrangement of the teeth which provides a continuous cutting face across both sections. To produce this type of face, the entering section of the tooth is always slightly ahead of the trailing portion so that there is no chance of blocking the chip flow. This eliminates chip congestion and permits a free flow of chips across the face of the cutter. In effect, it provides all the features of a solid cutter plus the added advantage of accurate adjustment for the width of the slot. This type of chip action is available only in the Barber-Colman design.

DESIGNERS OF STANDARD AND SPECIAL

INCREASES FEEDS AND SPEEDS

Feeds and speeds which would normally stall conventional type cutters can often be used with this new design. The depth of cut may be as great as the depth of the cutter hub without impairing the cutting efficiency of the cutters. Absence of chip accumulations reduces cutting temperatures to allow increased feeds and speeds.

LENGTHENS TOOL LIFE

The improved design eliminates any obstruction to the free flow of chips across the cutting face. Consequently, chip congestion found on conventional cutters of herringbone design is eliminated. Because of this chip action, cutting edges will produce many more pieces per sharpening. The absence of chip congestion also removes a major cause of tooth breakage.

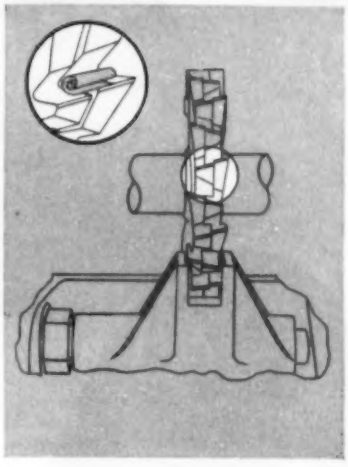
GUARANTEES ACCURACY

Through the interlocking feature, accurate slots can be milled throughout the life of the cutters. Conventional cutters rapidly become undersize with sharpening and must be discarded or used for other work. Interlocking cutters however, can be resharpened indefinitely. By using shims between the two sections, the width of cut can be accurately controlled for the life of the cutters.

The interlocking design also has flexibility for using a single cutter on several widths of slots. Slots wider than the cutting face can be made by shimming the two sections to the desired dimension. Barber-Colman cutters provide a greater range of widths because of the extra depth of interlock.

MADE TO ORDER

These Interlocking Side Milling Cutters are designed specifically to suit the particular requirements of your job. Ask Barber-Colman Cutter Engineers to show you how they will improve deep slotting on your operations. Send blueprints for quotation, or ask for a field engineer to call.



HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

Barber-Colman Company

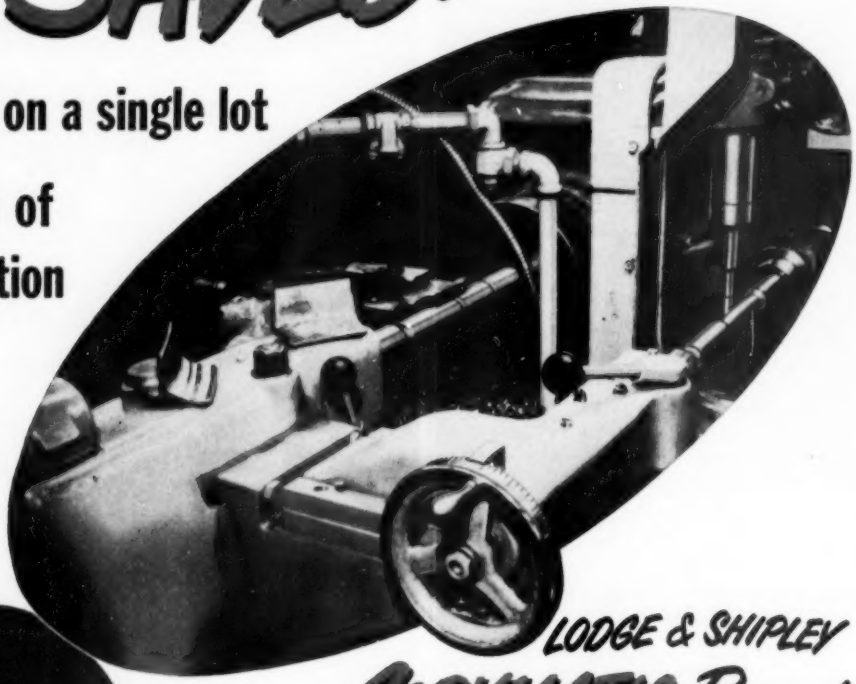
GENERAL OFFICES AND PLANT,, 514 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.

METAL CUTTING TOOLS SINCE 1908

...SAVED!

$8,000 on a single lot

87½% of production time!



LODGE & SHIPLEY

COPYMATIC Record

. . . at Lockheed Aircraft Corp., Burbank, California

Another outstanding example of the Lodge & Shipley COPYMATIC quickly paying for itself was recorded at the Burbank plant of this world-famous aircraft manufacturer. An operation characteristic of Lockheed's successful use of the COPYMATIC is shown in the photo and sketches.

A new method of machining the engine mount ring lug . . . was devised . . . to utilize the versatility of the new Lodge & Shipley Lathe. The savings on this particular part more than warranted the installation. The new lathe permitted an amazingly simple setup and a bare minimum of tooling. The former method required twenty minutes per part . . . now approximately 2½ minutes per part. Savings amounted to approximately $8,000 for the total lot.

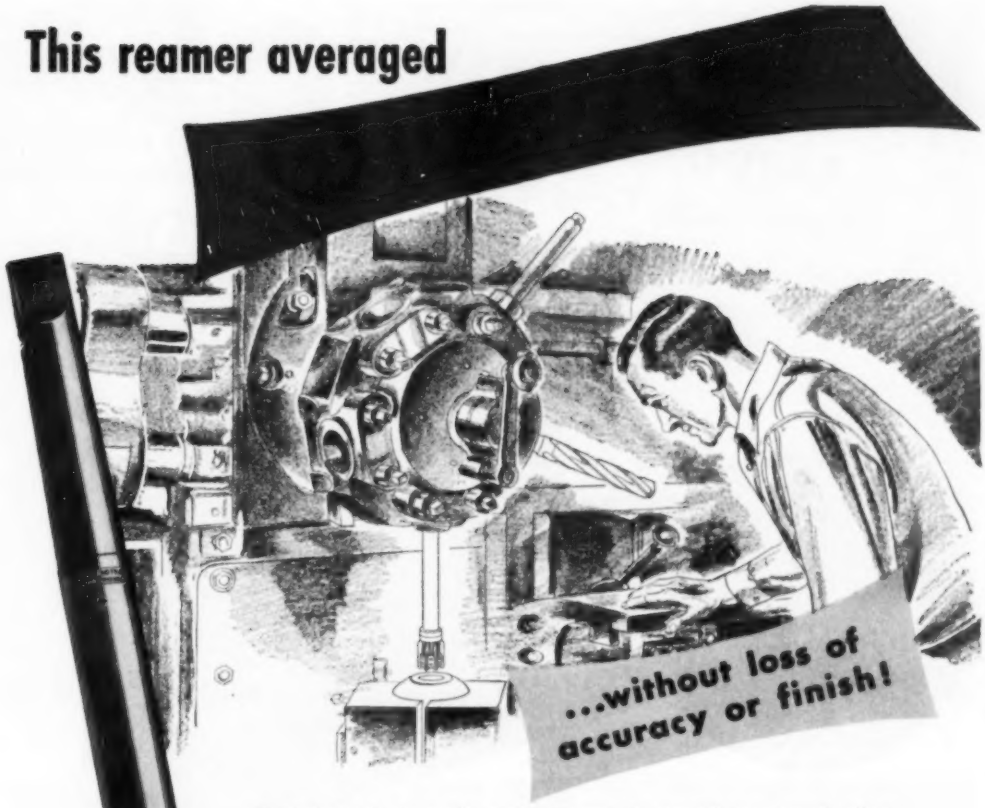
You, too, can use the COPYMATIC profitably. Write for complete details.

Typical Lockheed COPYMATIC application: Engine mount ring lug is machined with a compound radius (3" dia. by 50" dia.). Lug is 8740 forged steel. Note that part is clamped on tool carriage, tool is rotated at 651 RPM, 500 surface feet per minute; feed is .006" per rev.

THE Lodge & Shipley COMPANY

MACHINE TOOL DIVISION • 3059 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

This reamer averaged



The hole in the base of a projectile must be reamed to extremely close tolerances, both as to size and finish. Not every reamer can give you good results in these 1040 steel forgings without frequent regrinding. ◈ In tests on the set-up illustrated above, no other reamer equalled the performance of *Cleveland* High Speed Adjustable Reamers! These superior tools consistently averaged *1,800 holes per grind* without sacrificing accuracy or the requirement for a smooth finish of the hole. ◈ You too can get MORE HOLES PER GRIND with *Cleveland* Reamers. One of our Service Representatives will be glad to make arrangements for a test in your shop. Contact the nearest Stockroom, or . . .

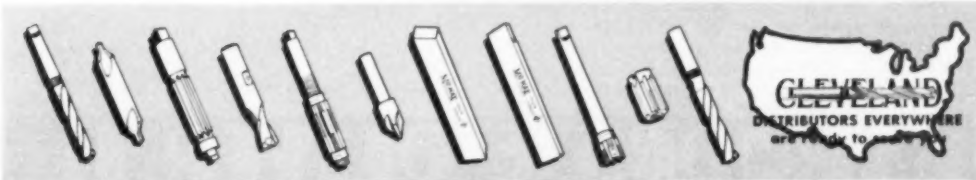
Telephone Your Industrial Supply Distributor

THE CLEVELAND TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58

E. P. Barrus, Ltd., London W. 3, England

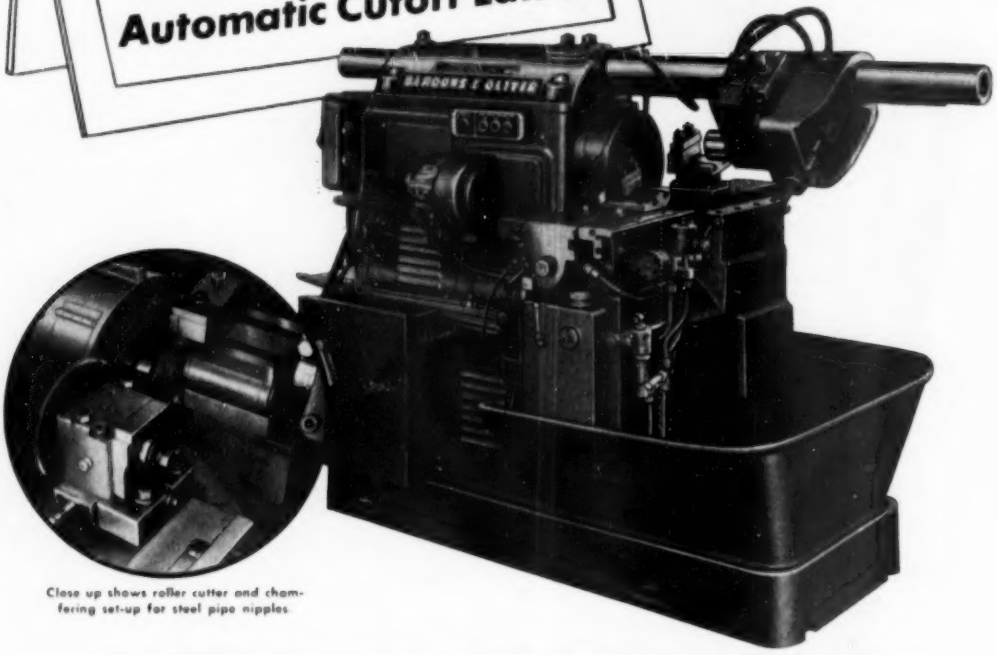


ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS

Presenting a NEW BARDONS & OLIVER Automatic Cutoff Lathe

No. 33—WITH CAPACITY TO 3" DIA. (2½" PIPE)

No. 34—WITH CAPACITY TO 4" DIA. (3½" PIPE)



Close up shows roller cutter and chamfering set-up for steel pipe nipples

Average production on steel pipe nipple blanks up to 6" long, cutoff with roller cutter and chamfered on both ends on O. D., ready for threading.								
Pipe Size	¾"	1"	1¼"	1½"	2"	2½"	3"	3½"
Pcs. per min.	43	36	28	22	18	15	12	9

Production estimates for lengths over 6" quoted on request. Correspondingly high rates of production can be obtained when cutting off other types of tubing or pipe.

The NEW BARDONS & OLIVER No. 33 and No. 34 cutoff lathe is designed for greater productivity. Either square cut ends or roller cut ends are readily obtained with a higher rate of production. Electric remote control permits automatic cutoff to any length. Spindle speeds range from 85 to 1100 RPM with four quick changes. In addition, a pair of reversible pick-off gears makes available a total of eight speed changes. Multiple cuts can be taken with the wide, heavy cutoff slides. Independent hydraulic systems are used for the cutoff slides and collet chuck operations. Since no cams are used, a complete change in set-up from one size and length of work to another can be made in less than one-half hour.

A newly designed Stock Feed Table, which operates automatically is now available for this new Automatic Cutoff Lathe.

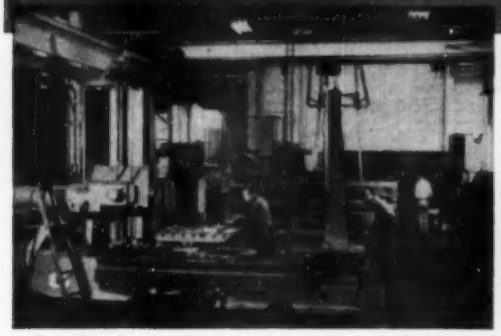
Complete information furnished upon request.

BARDONS & OLIVER, INC.

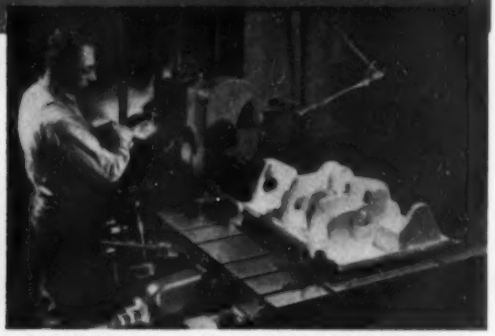
1134 WEST 9th STREET • CLEVELAND 13, OHIO

52 YEARS OF SPECIALIZATION

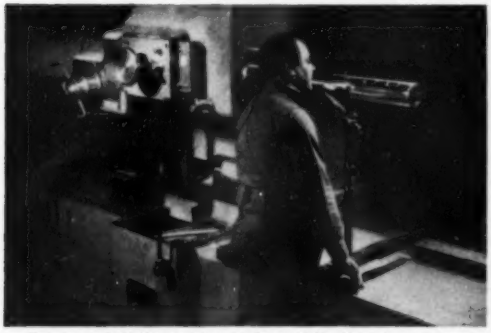
PAY DIVIDENDS IN THE DEFENSE EFFORT



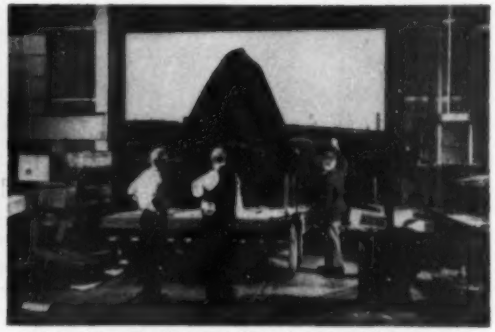
Our plant is operating at peak capacity producing horizontal Boring machines, NOTHING ELSE.



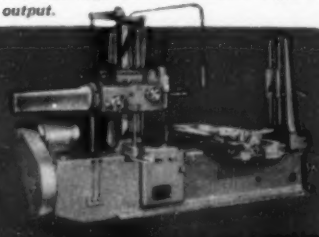
In addition, many outside suppliers are helping us around the clock (using many a Lucas purchased from us in years past).



Because of half a century of specialization Lucas men maintain high Lucas standards despite vastly increased output.



More shipments than ever, but, of course, defense priorities dictate who gets what. Perhaps this is the machine we originally scheduled for you.



THE NEW BRITAIN MACHINE COMPANY — LUCAS

A LUCAS *Precision*

.. is well worth waiting for

THE NEW BRITAIN MACHINE CO. • CLEVELAND

NEW
NEW
from SKF
the HESS-BRIGHT "SY"
UNIT PILLOW BLOCK
A new Unit Pillow Block, designed by SKF, to meet tomorrow's needs of modern industry.
Here are the design features:
● SKF Red Seal, made of DuPont Fairprene, retains lubricant. Wiping action of the seal against the inner ring is practically frictionless.
● Rotating flingers exclude dirt.
● Set screws for ease of installation.
● Spherical outer ring compensates for initial misalignment.
● Alemite fitting for re-lubrication.
● Interchangeability with existing installations made possible by bolt hole spacing and center height features.
● Shaft diameters 1 3/16" to 2 15/16".

From now on, the name to remember in Unit Pillow Blocks is HESS-BRIGHT "SY"—manufactured in our plants, to the same high quality standards as all SKF products. Ask your SKF Distributor to show you the HESS-BRIGHT "SY"; or write SKF direct for complete information on this *newest* Unit Pillow Block.

SKF INDUSTRIES, INC., Phila. 32, Pa. —*manufacturers of* **SKF** *and* HESS-BRIGHT *bearings.*

Cutaway showing of rotating Slinger and RED Seal—the extremely tight contact seal.

SKF®
BALL AND ROLLER BEARINGS

Keep Your on the OLIVER Line
— Cost Cutting
Production Boosting
MACHINE TOOLS

OLIVER
DRILL POINTERS

Properly machine ground drills give better performance. OLIVER Drill Pointers with each tip doing equal work, give balanced cuts—more accuracy—more perfect holes—more efficiency—longer drill life.

As Illustrated:

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to ½".

No. 310 For Drills ¼ to 3"—2-3-4 flute.

OLIVER DIE MAKING MACHINES

Efficient, speedy and accurate — effecting great savings in time and costs. Skilled labor is not required for sawing, filing, and lapping operations.

Available in 5 Models.

Bench Model S-1 (Illustrated) — Single Speed Die Maker for use on Tool Steel up to 1" Thick.

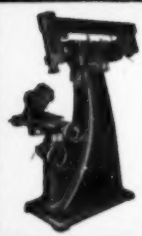
Heavy Duty Model (Illustrated) — 6 speeds, works in metal up to 2" thick, has variable strokes to 5", with hydraulic feed.

OLIVER ACE UNIVERSAL
TOOL & CUTTER GRINDERS

Keep your most difficult cutters sharp with Oliver ACES. They excel on high speed and Tungsten Carbide work. Direct reading for clearances reduces fatigue — eases operators' jobs.

The ACE excels for grinding face mills up to 15" • also slab mills • slitting saws • all types cutters and reamers.

2 Models: Heavy Duty (Illustrated) and Standard.



OLIVER 20" TEMPLATE
TOOL BIT GRINDER

Efficiently powered by a 3 h.p. motor, this OLIVER Machine grinds on the periphery of a 20" wheel. Capacity: tools up to 11½" wide x 13/16" high from 0 to 20° clearance. The OLIVER is developed for production sharpening of single point Tungsten Carbide and high speed tools—offers increased production, lower tool costs and savings in man-hours. Extremely fine finish assured.

Write Today for Complete Information

OLIVER INSTRUMENT CO.
1403 E. MAUMEE • ADRIAN, MICHIGAN

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

The Old Argument

Mr. A. H. Fensholt's letter on "Man or Robot" (*AM*, Mar 17 '52, p 96), expresses an argument that I have heard a number of times from people who have little confidence in the machine age. Whether Mr. Fensholt is really serious or not, he should consider history before he doubts the world's progress toward individual dignity.

Compare the average worker's lot today with the average in, say, 1400 AD. There's no question that we are better off. Even the worst-off ditch-digger today has a good chance at a reasonably comfortable life. There may not be much dignity attached to ditchdigging, but there certainly is attached to almost any present-day occupation where people live by their brains instead of primarily by their sweat.

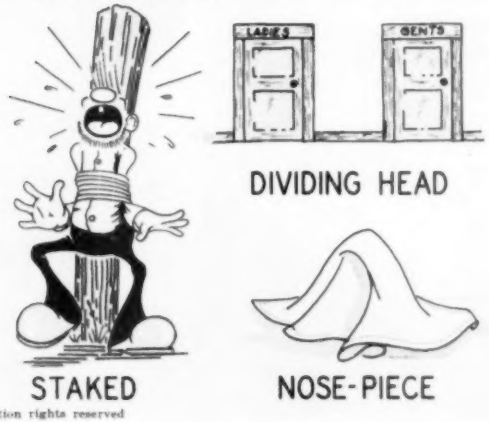
Our current trend toward automaticity is an indication that dignity of the individual will improve through the years. If you replace a row of punch presses and operators with an automatic setup, using electronic equipment to actuate the presses and auxiliary equipment, you may reduce the number of press-operator jobs, but you replace them with different jobs of much higher caliber. First, you must have better-educated setup men and repairmen. You must have more of them than previously, too, because of the complexity of the machines. Next, you must have higher-trained engineers to work out the mechanisms and cycles on the machines. There is surely more work in designing automatic machines than hand-operated ones, so you must have more engineers than before. Too, you must have more people in the research laboratories to develop new materials, processes, and ideas that will make the machines work on new principles.

After completely replacing the old setup with the new, you might have a few workers left over; not many, but perhaps a few. These people must work to live. Therefore, they can be used in new fields, new jobs that were never thought of before, and maybe one of them might be left over to do something in the field of human relations or international diplomacy. These fields, although not too much has come from them yet, are potentially the big answer to the dignity of the individual.

If you think that people are becoming automatons, try chopping wood all day long; and then compare

GRINETICS

BY D. G. SMITH



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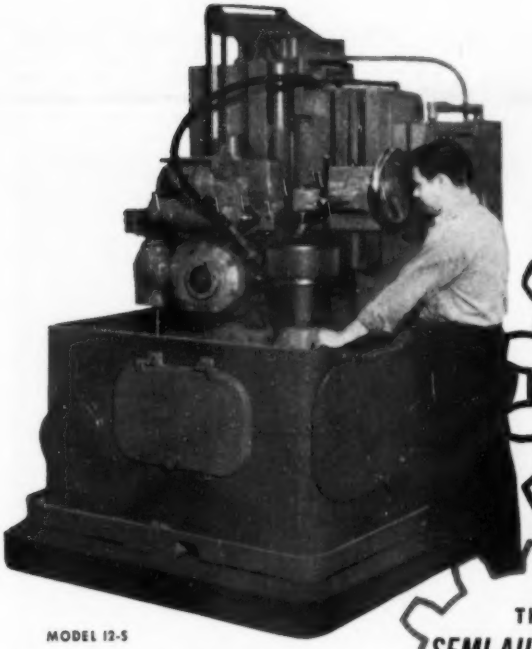


MODEL 12-S

Automatic HOBBING does the JOB

FASTER, BETTER, MORE ACCURATELY

THE *SEMI-AUTOMATIC* LEES-BRADNER GEAR HOBBING MACHINE

FEATURES AND SPECIFICATIONS

L-B patented Hob in-out mechanism

L-B electric hob shifter now available on the LEES-BRADNER Model 12-S

Rated capacity in steel . . . . . 4 DP

Maximum diameter capacity,

a) With 4" hob . . . . . 12"

b) With 3" hob . . . . . 13"

Travel (Max. face width) . . 16"

The pioneers of gear hobbing machines in this country have done it again!

Now Lees-Bradner brings you the ingenious Model 12-S *automatic* gear hobbing machine with the electric hob shifter.

This amazing machine produces gears of maximum accuracy—including right or left hand spur and helical gears up to 45°.

After loading, it is necessary only to press the starter button and the hob is fed automatically across the face of the work at constant speed. At the completion of the cut the machine stops for reloading. Hence, one unskilled operator can easily handle a battery of these machines.

If production time and accuracy are at a premium in your plant it will pay you dividends to talk to your Lees-Bradner representative—*soon*.

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

HEAVIER CUTS IN HARDER MATERIALS AT HIGHER SPEEDS

Get More Production with GORHAM "M-40-B" Tool Bits!

Get more out of your machine tools . . . raise your production curve . . . with Gorham "M-40-B" turning tools! Use "M-40-B" wherever the application of a Super High Speed Steel is indicated, as in machining heat treated alloy steels with large amounts of stock removal at high surface speeds.

"M-40-B" is a Super Moly grade with performance characteristics comparable to those of super tungsten high speed steel. It has extremely high red hardness, high Rockwell hardness, and offers maximum toughness and abrasion resistance. You can take heavy roughing cuts with it at high surface speeds and feeds . . . use it for high speed finish cuts as well.

"M-40-B" comes in square tool bits, 11 stock sizes, and in 23 stock sizes of rectangular turning tools. Bits and turning tools are accurately ground, uniformly hardened, ready to sharpen. Special sizes and shapes to your order. Illustrated with prices are three popular size "M-40-B" tool bits. See your distributor, or send direct for a trial order.

"M-40-B" is one of three cutting tool materials developed by Gorham. Others are Gorham "Standard", for the commercial field, and "Gormet", for turning soft or abrasive stock. They're completely described, with size and price lists, in a new free bulletin. Send for your copy today.

Gorham TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

14408 WOODROW WILSON • DETROIT 3, MICHIGAN

WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

the effect on your body and brain to that from the average factory job today. You'll find that even the most repetitive factory job, under good average working conditions, leaves a worker with energy and imagination enough to enjoy his free time instead of dropping like a clod into bed at night. It also leaves him with purchasing power that he can apply toward physical and mental comforts that add much more than most people realize to their satisfaction with life. Just try doing without them for a couple of months!

George Willis
San Francisco, Calif.

Marshall Plan for Detroit

I see in Spot News (*AM*, Feb 4 p. 79) that huge orders for trucks and jeeps are being placed in Italy. That makes pretty reading for the thousands of us guys in Detroit, skilled automobile workers, who are out of work because of the restrictions on civilian production. We can build trucks and jeeps, too, if given a chance.

What's the sense of giving jobs to Italians when it throws American workers out of work? Perhaps I'm extra sore because I was badly wounded at Anzio, but it seems to me that charity should begin at home. If we were doing the job, at least Uncle Sam would get his cut, too, out of our income taxes.

If they got the job because they have the steel and we haven't, why not just import the steel?

A. Pireti
Detroit

Carbide Burs

Your article on carbide burs at 90,000 rpm (*AM*, March 3) was of particular interest to us, and we wish to compliment you on the concise report of the work done at Barden Corp., and New Hampshire Ball Bearings, Inc. The facts are borne out by our own experience in this field during the past five years.

However, we wish to draw your attention to the fact that internal micro milling, as we wish to call it, is not entirely new, even in production applications of extreme accuracy, such as mentioned in your report.

At the General Electric plant, Johnson City, small, hardened-steel gear hubs for aircraft instruments are being finished on the ID to tolerances of 0.0001 in. by means of our grinder-millers set up in Monarch lathes. Unlike the setup you de-

another reason why J&L turret lathes produce { MORE CHIPS PER TOOL
MORE PIECES PER HOUR
MORE PROFIT PER JOB

MORE COOLANT ON CUTTING TOOLS!

An outstanding, standard feature of all J & L turret lathes is the *automatic, continuous* flow of coolant *through the working face of the hexagon turret* directly onto the tools and work. Tapped holes are also provided on top of the turret for additional pipe connections. This guarantees a copious supply of coolant where and when it is needed, regardless of the position of the turret or the length of the work —a necessity for best tool life.

P.S. You should know the other J & L features. Write to Dept. 710 for Catalog.

"World's most accurate and powerful turret lathes"

RAM TYPES: Bar, 1½" to 4½", Chuck, 10" to 12". SADDLE TYPES: Bar, 2½" to 5", Chuck, 12" to 18".

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., Springfield, Vt., U.S.A. TURRET LATHE DIV.

Combine an unbeatable product with the right *use* of that product, and you get – better *results*.

Combine, for example, VICTOR hand and power hacksaw blades and flexible-back band saws with the authoritative, timely facts on their selection, use and care which you'll find in the VICTOR Metal-cutting Booklet, and you'll get the fastest, most efficient, easiest metal-cutting results you *ever* had.

Tell your supplier you want VICTOR – tell him, too, to send you a supply of these valuable free booklets for the men in your shop.

1078A

VICTOR

SAW WORKS, INC. • MIDDLETOWN, N.Y., U.S.A.

Makers of Hand and Power Hack Saw Blades, Frames and Metal Cutting Band Saw Blades

scribe, the tooling is quite inexpensive, and we would venture to estimate the total cost at one-fifth of that you describe.

Our tool operates on a ¼-hp universal motor with a top load speed of 45,000 rpm, instead of on a costly high-cycle motor. It is true that at very small diameters, such as 0.093 in. and less, speeds above 50,000 rpm can be used to advantage, but it is also possible to finish such small bores at the relatively lower speed of 45,000 rpm, provided the design of the cutting tool is given every attention.

We agree with your thoughts that close control of uniformity of work material and carbide is important. We have found, however, that a greater range of change is permissible in the rpm of the quill.

Helmut W. Schumann
Precise Products Co.
Racine, Wis.

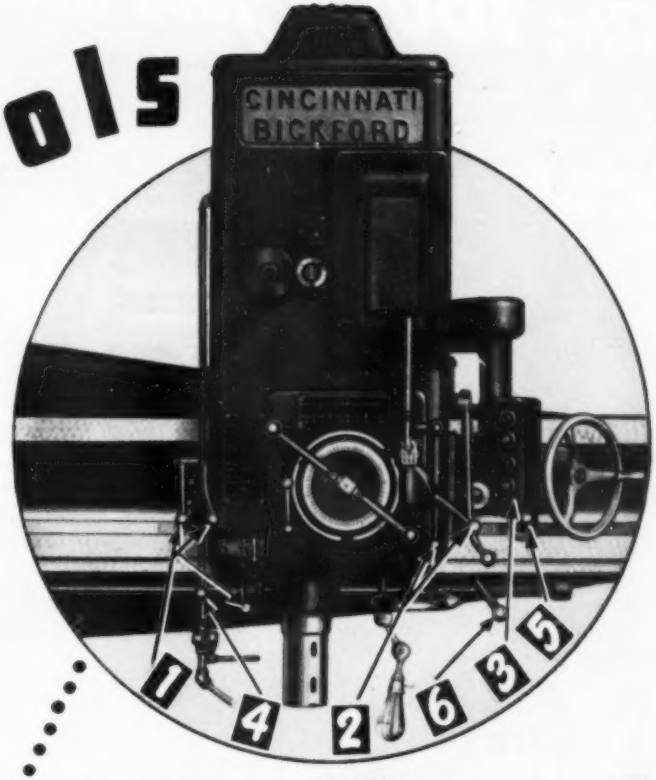
New Steel for Old

I note in your article on new British economy steels (*AM*, Feb 4) that several of these appear to be exactly the same as some we have used in this country for quite a while. In view of the critical situation of nickel and moly, I am wondering why it has taken the British so long to getting around to economizing on these elements when we thought of it quite a while ago. And if these steels are the same, why are they annnounced as new?

Roger Benton
Chicago

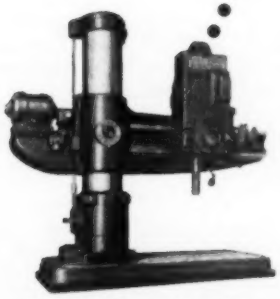
*Yes, some of these steels are the same as we have been using, and as a matter of fact we believe the British have also been using them to some extent. However, their use is no longer voluntary but is made obligatory by official edict, except in special cases where the original type is considered essential, as in certain aircraft applications, when special permission must be obtained. We announced them as new because they are officially new—to the British.—*Ed.

Fewer Controls



1. 3 levers control 36 spindle speeds.
2. 2 levers control 18 feeds (sliding gears)
3. One convenient panel for driving motor control, column clamping and unclamping control.
4. One directional lever, controls — arm elevating, lowering, clamping and unclamping, also automatic pressure lubrication of column.
5. Power rapid traverse of the head in either direction by single lever.
6. Speed clutch control—spindle start, stop and reverse by one lever.

and all at the Head



Equal Efficiency of Every Unit Makes the Balanced Machine

Controls are all centralized low at the head within easy reach. Operator movement required to use the Super Service Radial efficiently is performed in the shortest possible distance, with the least possible effort in the shortest possible time. For further information on the many other patented exclusive features of the Super Service Radial, write for Booklet R-29.

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62" KING Vertical Boring & Turning Machine at Beloit Iron Works, Beloit, Wisc.

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"Tough" is the word for the job being machined here. But it's "all in the day's work" for this versatile 62" standard KING.®

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1. A ***speed range*** wide enough to turn the small diameter center post and still do turning and form tool work on the large outside diameter—both at efficient cutting speeds.

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3. ***Hand controls*** sensitive enough to permit easy feeding of a large radius form tool.

4. ***Extra weight and rigidity*** that are necessary to provide chatter-free finishes.

5. ***Accuracy*** that will check out with a contour gauge.

Because KING mills have *all* of these advantages they meet *all* the requirements of this intricate job—just as they meet the boring, facing, and turning requirements of any other work, simple or complicated.

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King Vertical Boring & Turning Machines are made in 10 sizes —30", 36", 42", 52", 62", 72", 84", 100", 120", and 144".

American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

SPOT NEWS of Metalworking

- **Ryan Aeronautical Co. has new production orders for more than $25-million** of aeronautical products, increasing backlog 56% to more than $70 million. Largest single order in new group of contracts is from Boeing, calling for Ryan to increase output of aft fuselage sections, refueling pods, cargo doors and floor beams for the C-97 Stratofreighter.

- **Pacific Car & Foundry Co., Renton, Wash., has filed suit for $100,000 in special damages** and $25,000 a day for fixed damages against Machinists' Local 79 because of a walkout which shut down company's plant for several days. Company charges violation of "no-strike" clause, a clause which the union is seeking to have removed from a new contract.

- **Tin supplies for the U.S. are now assured for at least another couple of years**—barring shutdown of production or severing of supply lines. British, Indonesians, and Belgians have signed up with RFC at $1.18 per lb price negotiated by Churchill and Harriman. Only question left hanging: Do Bolivians, highest-cost producers, sign a contract at a higher price?

- **Economy drive in Congress has gained strength.** House committee voted to cut $4½ billion from $50-billion military appropriations request. Items hit: Navy's second supercarrier, plane production, Navy shipbuilding, and weapons and equipment for Army divisions.

- **Defense Department will wind up fiscal year with $3.5 billion in unobligated** funds by June 30. They will lose about $500 million of this through lapse of unobligated appropriates. Balance—mainly for Army procurement—will be carried over into next fiscal year through agreement between Congress and Treasury.

- **Wage Stabilization Board may be stripped of authority to handle labor disputes** as result of its recommendations in the steel dispute. This may result either from a House Labor Committee investigation of WSB or an amendment to the Defense Production Act proposed in the Senate.

- **Aluminum channels 5 ft long are welded six at a time** to flat sheet in what is believed to be first continuous automatic high-production seam welder. Rate: 100 assemblies per hr. Six channels are tack-welded, then assembly is pulled between welding wheels by automatic conveyor. Work is clamped and unclamped automatically. Each set of wheels welds only when channel is passing through. Wheels are dressed automatically.

Sign of the times: steel customers are rejecting steel not meeting quality and gage specifications, a practice unheard of 5-6 months ago when users were grabbing all the tonnage they could get.

- **Machine Tool Commission to study machine tool needs** for permanent defense mobilization program and to study what can be done to keep the machine tool industry healthy is to be created, despite Charles E. Wilson's resignation. Commission may be faced with a five-year job. For detailed story, turn to page 117.

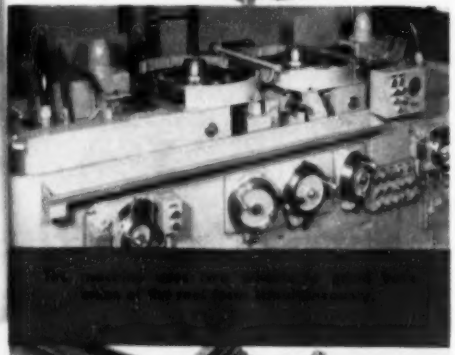
- **Military contract letting continues to drag.** Procurement officers awarded contracts covering only half the money available in first eight months of fiscal 1952. In July-February period $24.9 billion was let, about $21 billion of it for hard goods. That left $26 billion to obligate as of March 1.

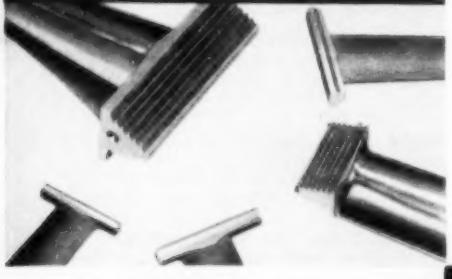
- **Three new-type ships are on order for Army Transportation Corps.** They are flat-bottomed, self-propelled barges to unload ocean-going ships in shoal water. Purpose is to speed unloading. This type of barge will rest level on bottom instead of keeling over in mud-flats when tide goes out. Three ships will be 210 ft long, have 38-ft beam and 12-ft draft. Builders: Puget Sound Bridge & Dredging; Higgins, Inc., and Liberty Dry Dock.

- **Machine-tool cancellations were heavy again in March,** as they were in February. Tooling for the Sapphire jet engine job was cut back drastically, for one thing. However, Washington sticks to its prediction that new orders for machine tools this calendar year will be up around $1 billion. New orders and shipments curve came close together in March.

Production-Proved

EX-CELL-O Machine Grinds Jet Blade Roots





Dovetail and pinetree forms, in various sizes, are ground from rough forgings.

PRECISION TWO-WHEEL FORM GRINDER GIVES FINE FINISH, HIGH PRODUCTION

This production-proved Ex-Cell-O Precision Two-Wheel Form Grinder finishes roots of jet engine blades with speed, economy and precision. It is fully automatic except for loading, unloading and pushbutton starting.

Two 24-inch diamond-dressed grinding wheels are used, the work reciprocating between them. Dovetail or pinetree forms of various sizes can be ground economically from semi-finished and rough forgings. Work reciprocation, wheel feed to finish size, coolant control, unclamping, wheel retraction, and wheel dressing are all done in an automatic cycle.

Controls are so simple that unskilled operators can do this high precision work. For more information and complete specifications contact Ex-Cell-O in Detroit.

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51-84

Washington

Controls all but went out the window when mobilization boss Charles E. Wilson quit in a huff. His resignation raised serious doubts in Congress, in industry, even in the controls agencies themselves, as to whether government should continue regulating prices and wages.

• • •

Economic stabilization is still up in the air. You now can bet on wage-price controls until January 1, anyhow. But they'll be rubbery controls, bending a little more every time there are real pressures for price or wage increases.

The government caved in on wages, once and for all, in the steel dispute. Despite Wage Stabilization Board's protests that its recommended 26-cent steel pay boost breaks no wage ceiling, it opened the door for a flood of new wage increase demands. You can't say "yes" to the steel workers and "no" to employees of the steel fabricators, coal miners, oil workers, aluminum workers and all the rest.

• • •

Price ceilings are gone, too, to all intents and purposes. Sooner or later, production cost increases show up in prices.

So stabilization strategy now is to delay as long as possible on both price and wage increases. It's strictly a rear-guard action.

• • •

Congress will go along with this kind of stabilization, at least for another six months. You don't kill price-wage controls formally in an election year. Especially when there is a chance of keeping food and other consumer goods prices down a little longer. And even Wilson, before he left, recommended continued controls until January 1.

• • •

But a reshuffle of the controls set-up became essential when Wilson quit. It would have been tough enough to find a successor had the steel wage issue never come up. But Wilson put the kiss of death on his dual production-stabilization boss role. After the steel case, he said, the job was impossible.

So Truman decided to split controls leadership. That means a War II type of set-up—a strong wage-price organization like that headed by Fred Vinson and a WPB-type of production controls agency.

• • •

Air Force is talking expansion again. Now the flying brass want something more than the 126 combat wings and 17 transport wings scheduled to be ready by 1955. They'd like to have—and probably will get—another ten wings. Additional aircraft would be troop carriers and helicopters.

• • •

Congress soon will get the tab for Korea—in dollars, that is. So far expenditures have been met out of appropriations chiefly for the defense build-up.

Korea has cost about $2-billion so far, budget experts of the Defense Dept. estimate. But that doesn't include indirect military costs like pay, routine operations of ships and aircraft, training and other costs incidental to maintaining the troops employed.

• • •

Military production continues to lag. You get an idea how much from Defense Dept. estimates on steel stocks held by defense contractors. When asked what a steel strike would do to arms output, the brass figured it would rock along at March levels for weeks on most items.

That's because output still is behind schedules. Metal is ordered, in advance, in accordance with schedules, rather than with actual production rates.

• • •

Cost-of-living escalator wage contracts are not as solid as they once seemed. Things are happening to make union leaders wary, ask for changes.

One is the current drop and possibly leveling off of the BLS living-cost index. Non-operating railroad workers just took a one-cent wage cut. Auto workers stand to lose some of their 24-cent cost-of-living bonus on June 1. (UAW-CIO would like to raise the five-cent floor under the bonus.)

Other factors: BLS may have to make shortcuts in computing the index if Congress cuts funds. And the new index coming out in February will have a postwar base. These will give unions legal grounds for reconsidering the escalators even in five-year contracts.

• • •

Two looks at Taft-Hartley: Unions scream about damage suits filed by employers, such as $66,700 Oliver Corp. suit against left-wing electrical workers for breaking no-strike agreement. Yet union treasuries continue to swell. In six months, UAW-CIO funds rose more than $1 million. Last year AFL Machinists took in $1.7 million more than they spent.

• • •

On-the-job and apprentice training to alleviate shortage of skilled workers is encouraged by Manpower Policy No. 5 just issued by Office of Defense Mobilization.

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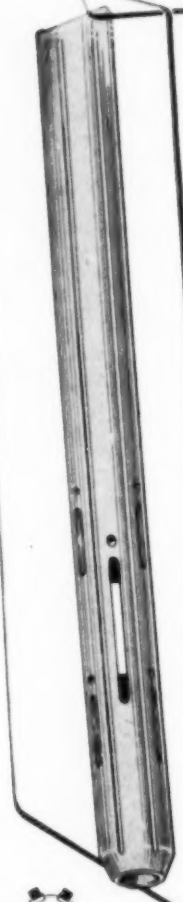
in Hydraguide steering control generated by Microhoning



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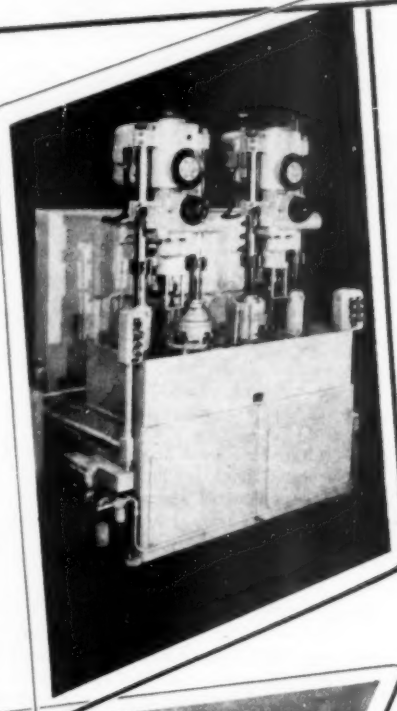

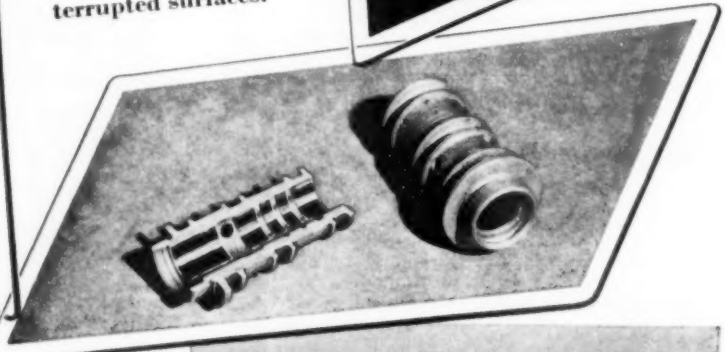

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Detroit

Things were never so quiet at Willow Run, what with Edgar Kaiser and associates sitting tight on rumors that F-K may merge with Consolidated Vultee Aircraft Corp. The studious silence notwithstanding, K-F has been talking merger with Atlas Corp., which holds the reins at Convair.

K-F has lately shown an expanding interest in aircraft. It's now building Fairchild C-119 packets at Willow Run, will move into production of Chase C-124 C-123s in the fall and also builds aircraft engines and structural parts.

Combining operations with Convair would not only give K-F a bigger hand in the aircraft industry, but also would enable the corporation to ease out from under heavy losses in the auto field, via the tax-credit route.

• • •

Latest move by the increasingly aggressive Ford Motor Co. is activating ulcers throughout the auto industry.

Ford submitted to NPA a brief which protests the division of scarce metals among auto builders. Ford claims the NPA base period is unfair and has caused the company to suffer earning losses in excess of $200-million.

NPA uses 1947-49 as a base period. Ford says the year ending June 30, 1950, is the more proper period on which to base materials allotments. Reasons: the 1947-49 market was unsettled and people bought any car they could get, whereas the 1949-50 market was becoming stable; moreover, that date would reflect more accurately the gains being made by the company after Henry Ford II took over in '45.

• • •

If NPA were to follow Ford's recommendations, auto industry rankings would be rearranged importantly, with Ford realizing most of the benefits. Chrysler Corp., now the No. 2 producer, would change places with Ford, currently in the No. 3 slot.

NPA's formula ranks the industry this way: General Motors, 41%; Chrysler, 21.43%; Ford 21%. Ford wants it revised so that GM would have 42.50%, Ford 23.42% and Chrysler 22.98%. This ratio would virtually cut in half the schedules of such independents as Kaiser-Frazer and Willys.

Biggest, most logical argument against changing the base date to end in mid-1950 is that during the spring of that year, Chrysler and the CIO auto workers engaged one another in a 100-day strike, thereby distorting production figures for that year. In its brief, Ford infers that it was overtaking Chrysler at that time, perhaps would have moved into second place even if Chrysler had been in full production.

Behind the Ford appeal: intense demand for the 1952 Fords, Lincolns and Mercurys. While new passenger car stocks in dealerships are reported (by Automotive News) to average out nationally at 5.5 units per dealer, Ford and Lincoln-Mercury dealers average less than three cars apiece, an extraordinarily low level.

• • •

Problem of a perfect gun-sighting mechanism for tank turrets has not yet been solved. Ordnance is seriously thinking the solution may lie in electric rather than hydraulic controls; the flywheel effect of the armature is posing problems, however.

• • •

Gerity-Michigan Mfg. Co., Adrian, Mich., has built a magnesium foundry capable of producing up to 150,000 lb of castings monthly. Primary market: aircraft engines.

• • •

Super-dooper experimental car models, like GM's Le Sabre, Buick's XP-300, Ford's Continental 195X and Chrysler's K-310 are being joined by another pair of eye-catchers, the Packard Pan American and Chrysler's C-200.

The Pan American rests on a standard Packard convertible frame but the body has been given the "simple splendor" touch. Styled and built by Henney Motor Co., Inc., the body carries a minimum amount of chrome, appears as trim as a jet fighter. Over-all height is 53 in. with top raised, 36 in. to the top of the door. Power plant is a Packard 327 "Thunderbolt" producing 175 hp. The hood is slit by an air scoop which increases the flow of air to the carburetor.

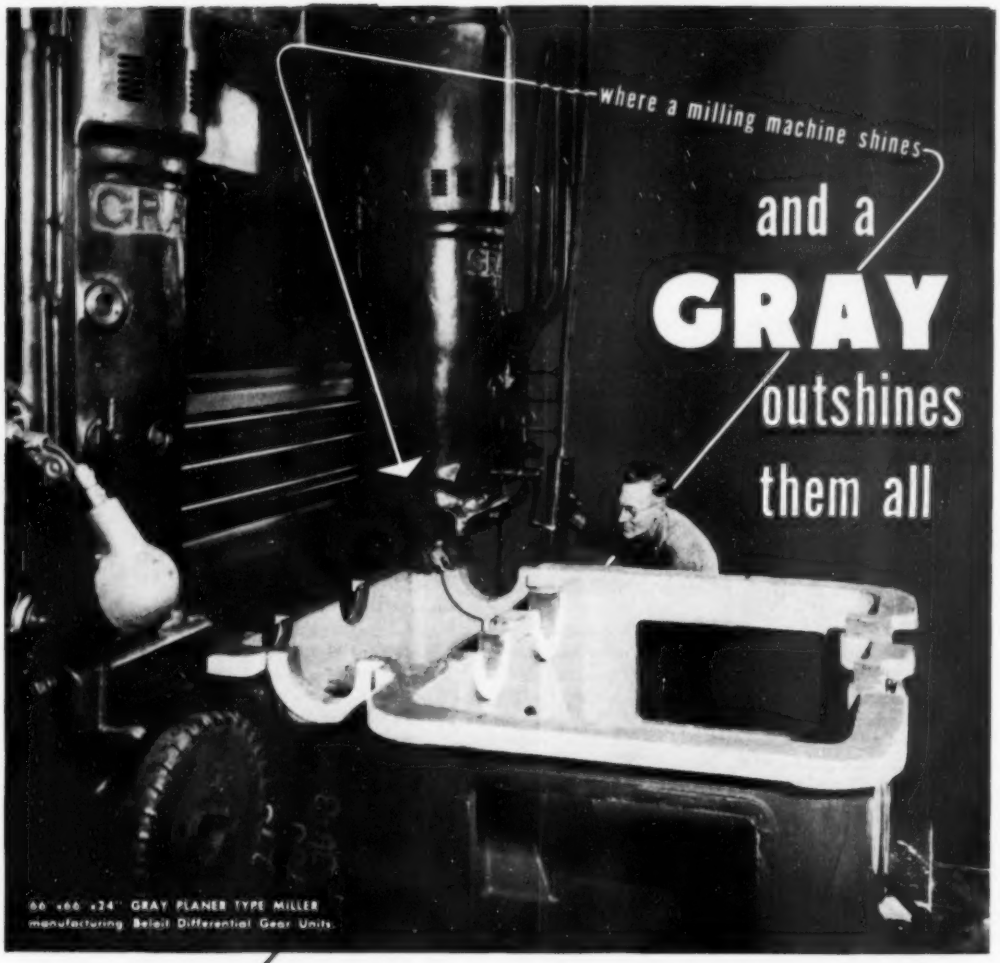
The green-and-black C-200 is similar to Chrysler's earlier experimental model, the K-310, except that it is a convertible. A standard Chrysler chassis and engine were shipped to Turin, Italy, where Ghia built the underslung body and assembled the auto.

• • •

Dynaflow production at Buick is going up, now that the roof imposed by government restrictions has been removed. Output will rise from 82 to 88.7 percent of total production. The super series will be 97% equipped with the automatic transmission, the special, 70%. The unit is standard equipment on the Roadmaster series. Since dynaflow was introduced four years ago, more than 1,150,000 units have been produced.

• • •

Something new in insulating material, and other fields as well, is synthetic quartz, made in the form of quartz in diameters so fine it can be successfully produced as paper. The manufacturer: Glas Fibers, Inc., Waterville, Ohio.



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Machine Tools

Charles E. Wilson's resignation is not expected to affect adversely the plan for creating a Machine-Tool Commission to study long-term defense mobilization and the tooling needs thereof.

The Commission also would study what should be done to maintain the machine-tool industry in a healthy state.

• • •

Mr. Wilson's office was behind the plan. And at the time of his resignation, Mr. Wilson had an appointment with Harold Vance, Studebaker head, to discuss the program. Mr. Vance had been picked as chairman of the Commission.

The plan from the beginning was Clay Bedford's creation. And he now has taken hold of it and says that he intends to see that the Commission is firmly established and begins to function as soon as possible. With that end in view, he had conversations with Mr. Vance last week. • • •

Mr. Bedford intends to resign shortly his office as Special Assistant to the Secretary of Defense.

But he says that before he retires to private life his No. 1 project is to get the Commission rolling. It is not yet known what government agency will sponsor the Commission.

But you can be sure of one thing: It will come into being even if Pentagon has to be sponsor (which is unlikely).

• • •

The Commission is looked upon as a five-year job. It will hold hearings and will make reports from time to time. It may recommend legislation for Congressional enactment.

It will be a five-man Commission, despite some sentiment on behalf of enlarging it to seven.

There will be no actual military "brass" on the Commission. But the three branches of the service will be represented. Suggested members: Lt.-Gen. Levin H. Campbell, former chief of Army Ordnance, and Admiral Ben Morrell, retired chief of Navy Bureau of Yards and Docks.

A machine-tool builder will be a member of the Commission. • • •

Operation of this Commission will create new machine-tool orders to tool up a permanent manufacturing establishment for war materiel.

Pentagon is reported to have ready a list of projects to be tooled up under the plan. If this is true, it removes at the beginning one of the most troublesome problems, which could have stymied the program altogether.

• • •

The revised E-1-B, which authorizes machine-tool builders to schedule deliveries to the armed services on the basis of each builder's order board, is set to go into effect around May 1.

It has been delayed up to now by the reluctance of the Joint Chiefs of Staff to be pinned down to a printed master preference list of defense contractors for seven military claimant agencies.

This list was being printed in Washington the past two weeks to be ready for distribution to builders and other interested parties.

The new system is being made public as an amendment to NPA's M-41. Part of E-1-B became effective a year ago. But builders then did not have a master preference list to go on.

• • •

Two conservation orders, one eliminating fancy electrical equipment on machine tools and the other stripping down the paint job on machine tools, are being issued by NPA.

This is a surprise. The Department of Justice had held up these orders when they were originally suggested several months ago. Justice suddenly has come through with its blessing.

• • •

Whether machine-tool builders should be allowed to ship unrated orders if they do not interfere with deliveries of rated orders is a hot issue in Washington. There is no intention at the moment of relaxing the ban on shipment of unrated machines. Perhaps a month or two from now NPA will take a kindlier view of the matter. • • •

Top defense officials haven't wavered in their belief that new machine-tool orders this year will touch $1 billion.

Some Pentagon officials support this position and point to the military production projects now bottled up for one reason or another. Many of these projects should be released later this year.

Ammunition is one example. A big program is pending which should break soon with sizable machine-tool orders.

• • •

Ralph C. Howe, executive vice president New Britain Machine Co., has assumed office as director of Metalworking Equipment Division of NPA. He succeeds Swan Bergstrom who is returning to vice presidency of Cincinnati Milling Machine Co.

George E. Merryweather, secretary Motch & Merryweather Machinery Co., is succeeding Tom Rudel, president Rudel Machinery Co., as assistant to director of Metalworking Equipment Division.

Roger M. Knox, assistant to president Fellows Gear Shaper Co., is taking on assignment as chief of Machine Tool Section, Metalworking Equipment Division.

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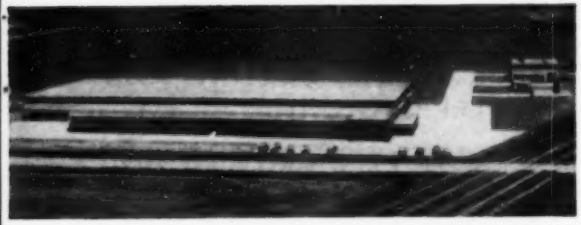

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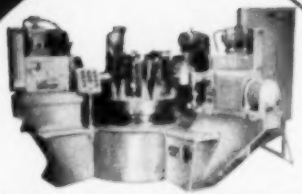

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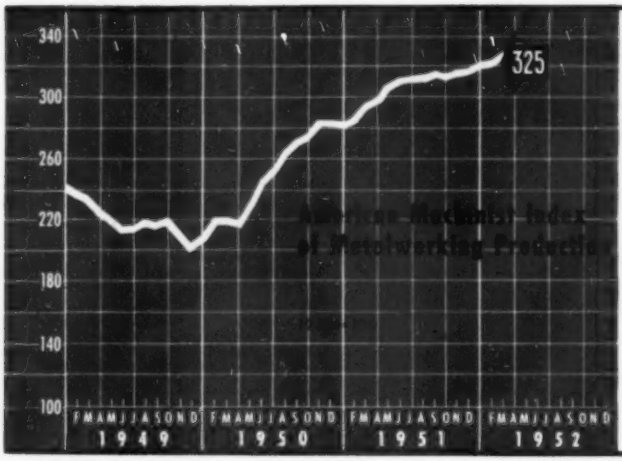
Gaging Metalworking



INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	MAR '52	FEB '52(p)	JAN '51(r)	FEB '51
	325*	323	320	297
Machinery	325	322	293	
Electrical Manufacturing	368	364	333	
Automobiles, Trucks	219	218	251	
Transportation Equipment	500	493	337	
Other Metalworking	317	314	299	

* Estimated (p) Preliminary (r) Revised

Chances are that metalworking production will rise a bit in the second quarter. At the worst, it will stay even with the first quarter.

Military output will be responsible. Defense operations are slowly broadening. And that is giving a lift to Metalworking which is sagging in other spots, such as appliances.

• • •

A quick look at these metalworking lines shows:

Farm machinery, tractors and industrial power units are scheduled at high levels through the third quarter. But at least one maker geared his production to anticipated demand at the year's beginning and will not change his rate even if more steel should come out.

• • •

Refrigerator makers are overloaded with inventory. They don't expect demand to perk up enough the rest of 1952 to expand production much if at all.

Domestic automatic washing machines and dryers are the only "hot" appliance items.

Diesel-electric locomotive building is to be boosted in the next quarter. Up to now, a reduction had been contemplated.

Production equipment makers are nearing a new post-war peak. And they will stay up there throughout 1952 and probably well into 1953.

Aircraft parts makers are working on heavy schedules which gradually will move upward as new facilities are completed.

Automobile industry is one of the most uncertain factors. Parts suppliers are looking for an increase in releases from Detroit soon, as steel eases. But many observers have their fingers crossed as to whether auto makers can sell more cars than they now are assembling.

Stamping plants report business looking up, thanks to defense orders. But the industry still is running at only 60% of capacity.

Backlog, at current rate, is 24 weeks from military, 18 weeks from automotive, 16 from all others.

Any prospective gain in auto production has not yet made itself felt in the stamping field.

• • •

Drop forging people say that they are up to full capacity, with six-months' backlogs.

Normal backlog: 2-3 months. Shops do not have a balanced inventory of bar stock, but they will have ample supply to keep running full.

Malleable and gray iron foundries have made gains in certain cities as result of increased buying by auto people beyond announced quotas.

Some non-ferrous foundries are limping along, but see brighter days ahead (in third quarter) as aluminum becomes easier to get.

• • •

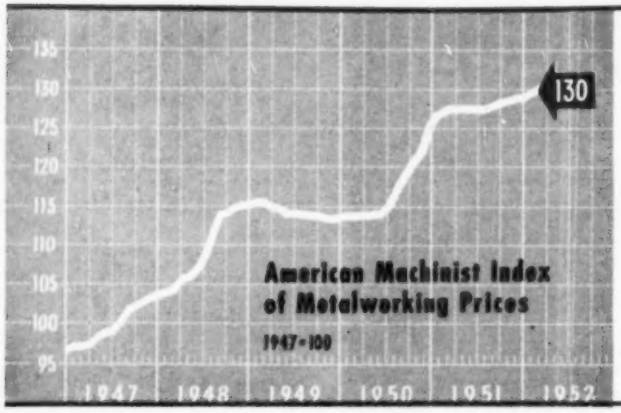
Rundown of materials situation shows: Steel is continuing to ease. Sheet is plentiful, but plates and structural shapes are tight.

Copper supply is likely to be on touch-and-go basis for several months. Tonnage of refined copper reached new low in February and March. April will be still lower. Copper importations this quarter will be less than in first quarter.

Aluminum production will be up some in third quarter. It will go even higher in final quarter.

Nickel stays very short. Lead supply is good, and controls are almost off. Zinc also is in much better shape.

Gaging Business



PRICE INDEX

	MAR '52*	FEB '52	JAN '52	FEB '51
	130.0	**130.0**	**129.2**	**127.1**
Metalworking Machinery	136.2	136.2	133.8	
Other Machinery except Elect.	132.9	132.8	132.1	
Electrical Machinery	126.6	126.5	126.8	
Fabricated Metal Products	128.2	126.7	123.4	

*Estimated

Industrial output is nosing upward. Federal Reserve index stood at 222 in February, up 3 points from January (1935-1939 = 100). March probably was a point or two higher.

Defense production now is about $4 billion a month. It should be $5 billion a month by next December. It will bolster general business a lot.

• • •

Here is one measure of what activities are in Metalworking: Total output currently is at annual rate of $100 billion. It should top $115 billion by year's end.

• • •

Corporation profits after taxes are expected to shrink further. The cost-price squeeze will cut profits.

Labor costs will go up. Steel is starting the trend. Price advances will not cover them. OPS is going to be hard to convince that anyone needs a price boost.

American Machinist Index of Metalworking Prices reveals that prices have gone up very little the past year. The index stands at 130, with 1947 as 100. That is up only 3 points from a year ago.

March is believed to have remained unchanged from the February level.

Prices of fabricated metal products have increased five points, and metalworking machinery less than two points.

• • •

Labor situation is about like this: Plenty of semi-skilled and unskilled men are available in most centers. But a shortage of skilled men still exists.

These classes of labor are tight: tool and die makers, pattern makers, journeymen machinists, some machine tool operators.

Some West Coast aircraft makers are trying to recruit skilled men in Detroit.

WEEKLY BUSINESS INDICATORS

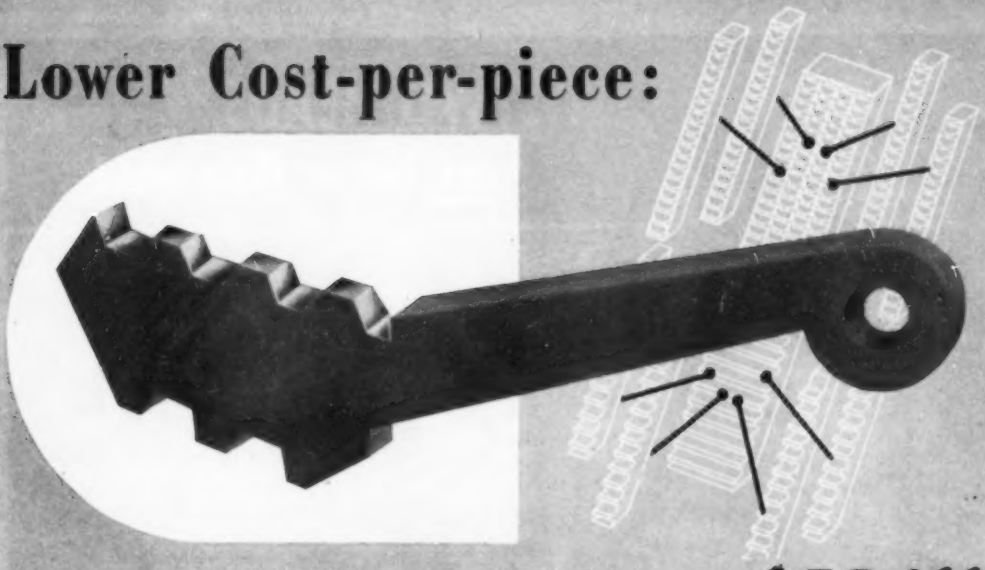
	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-25 = 100)*	239.8	238.7	235.0
Steel ingot production (thousand tons)	2120	2131	2047
Electric power output (million kilowatt hours)	7263	7354	6767
Production of automobiles and trucks	131,191	125,347	184,494
Engineering construction awards (*Engineering News-Record*, millions)	$345.7	$271.6	$236.8

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	278	275	423
Vacuum cleaners sales (thousands of units)	236	223	287
Washers sales (thousands of units)	256	214	341
Household electric ranges sales (thousands of units)	65	89	124
Radio production (thousands of units)	653	632	1313
Television production (thousands of units)	409	405	679
Gear sales index (1935-1939 = 100)	539.5	670.6	809.1
Foundry equipment new orders index (shipments, 1937-1939 = 100)	200.4	404.5	638.6

* Seasonally adjusted.

Lower Cost-per-piece:



BROACH REDESIGN *cuts tool costs* $530.00 *saves on maintenance, too!*

The original tooling to produce the forms on the above part incorporated each contour in a solid broach. Detroit Broach engineers recommended "breaking up" each form into individual inserts as well as rough and finish sections. The result was an immediate saving of $530.00 per set of tools. While the rate of production remained the same, the smaller size and simplified form of each insert made tool sharpening costs drop substantially. Further, if some part of the form was damaged, only one insert, either "rougher" or "finisher"—not an entire form broach—needed replacement.

These are typical savings that can be had when broaching tools are studied by qualified specialists with an eye toward production efficiency . . . toward lowest cost-per-piece. Detroit Broach engineers *are* such qualified experts since they work with the design and manufacture of broaches and broaching tools exclusively. Whether your problem is a new broaching application or boosted efficiency from a present broaching job, why not get Detroit Broach to look in?

DETROIT BROACH CAN CUT YOUR COST-PER-PIECE *by*

1 Developing broaching set-ups to replace other, more costly machining methods.

2 Redesign present broaches and broaching set-ups to make them more efficient.

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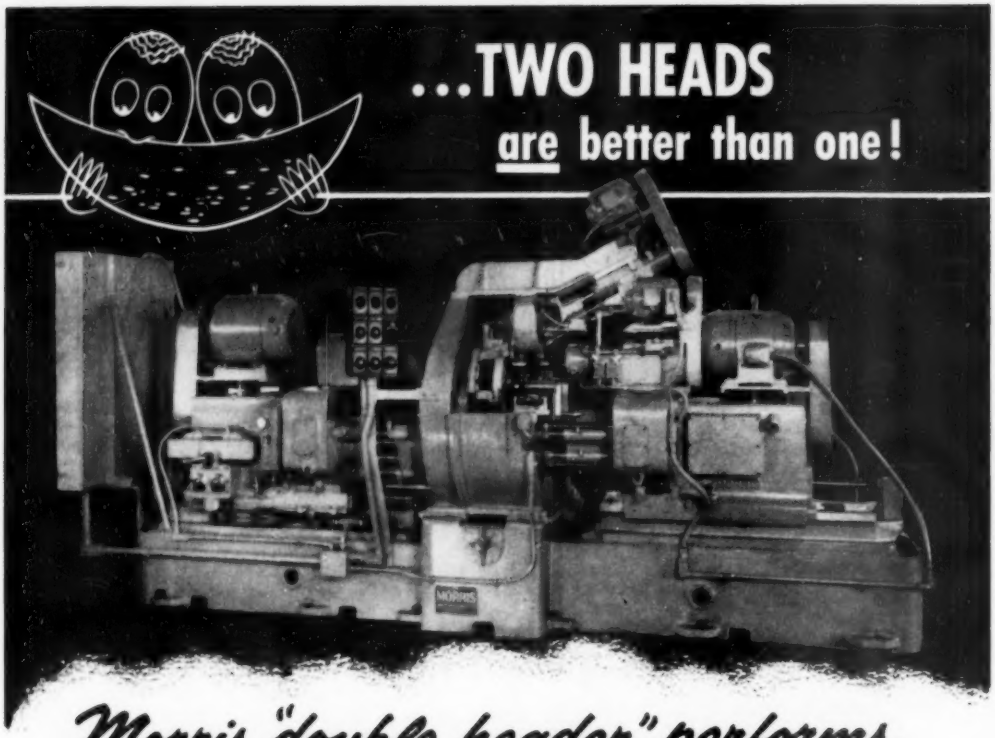

Morris "double header" performs 29 operations with a single loading!

Two heads are definitely better than one when you want higher production at lower cost. The MORRIS Horizontal Two-Way, 6-Station Machine illustrated here is a good example.

It drills, reams, spotfaces and taps all holes in crank shaft main bearing caps, performing 29 operations with a single loading and is production rated at 70 pieces per hour at 80% efficiency.

A self-contained hydraulic unit mounted on a slide on the right-hand side of the machine carries a 14-spindle head. A similar slide on the left-hand side of the machine carries a 12-spindle head. One single spindle unit, mounted angularly at Station 6 drills a 1/4" hole while a lead screw tap feed, mounted horizontally, taps a 5/16-18 hole.

OPERATIONAL SEQUENCE

STATION 1	Load
STATION 2	RIGHT HAND HEAD: Drill 2 holes for 5/16—18 tap. LEFT HAND HEAD: Drill Thru 2 17/32 Dia. holes. Drill Thru 4 37/64 Dia. holes.
STATION 3	Idle
STATION 4	RIGHT HAND HEAD: Spotface and Chamfer 6— .94" Dia. Bosses LEFT HAND HEAD: Drill Thru 4 37/64 Dia. holes.
STATION 5	RIGHT HAND HEAD: Spotface and Chamfer 4— .94" Dia. Bosses Chamfer for 5/16-18 tap 2 holes. LEFT HAND HEAD: Ream 2 holes .578—.577.
STATION 6	ANGULAR AUXILIARY UNIT Drill 1/4 Dia. Angular Hole. RIGHT HAND HEAD: Tap 2 5/16—18 Holes. LEFT HAND HEAD: Idle.

If your work requires numerous drilling, reaming, tapping, boring and similar operations on a mass production basis, your inquiry is invited.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Write-Offs Should Be Optional

America possesses a precious national asset which is one of our greatest safeguards against war.

That is our huge industrial capacity. Our capacity to produce planes, tanks and guns far outstrips that of any other country. We are in a class by ourselves.

If we are wise, we will do everything in our power to conserve this asset. Our survival as a nation may depend upon it some day.

Faced by these facts, our government acts as though it doesn't care what happens. Deterioration of our industrial plant seems of no moment. If the equipment becomes obsolete, what of it?

At least that is the attitude of the Treasury Department. Its policy is not alone one of indifference. It actually is standing in the way of modernization.

TAKE REGULATION TD-4422. It was put into effect back in 1934. And the Treasury Department is still clinging to it. It provides that production equipment is to be written off for tax purposes over a long period — 15 to 25 years.

This regulation is thoroughly unrealistic. It does not take into consideration the fact that times have changed. It stretches out the time of recovery of capital far beyond the reasonably foreseeable future.

It penalizes modernization. It forces the manufacturer to retain old machinery long after it is obsolete in design.

What could be more disastrous to our national security than to allow the Treasury Department, through the continuation of archaic rules, to encourage dissipation of a great national asset? What could be more hurtful to our industrial might as a nation than to let our plant equipment deteriorate before our eyes?

THERE IS a remedy. It is simple. That is for Congress to do as Lloyd D. McDonald, executive vice president Warner & Swasey Co., suggested before a Senate committee on April 2—amend the Internal Revenue Code so that the rate of recovery of capital invested in production equipment is optional with each manufacturer.

If he buys a new machine, he can write it off in two years, five years, ten years, or longer.

This proposal is not new, but time-tried. It has been applied with notable success in Sweden and in Switzerland. Plants in those countries are among the most modern in the world.

It should be adopted here. In fact, tax authorities have strongly advocated its adoption. But no action has been taken up to now by Congress.

OPTIONAL DEPRECIATION should do more than any other single measure to keep our factories up-dated in production equipment. It will help safeguard our fabulous ability to produce goods—armament for our defense and peacetime products for our comfort and well-being.

We urge Congress to scrap Regulation TD-4422 without delay and put in its place an optional depreciation law.

Burnham Finney

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1. Ram is positioned quickly, accurately by instant action of clutch and brake.
2. Starting and stopping by just a light touch.
3. The single control lever is at the most convenient operator position.
4. Clutch and brake operate without grab . . . are powerful and smooth in action.
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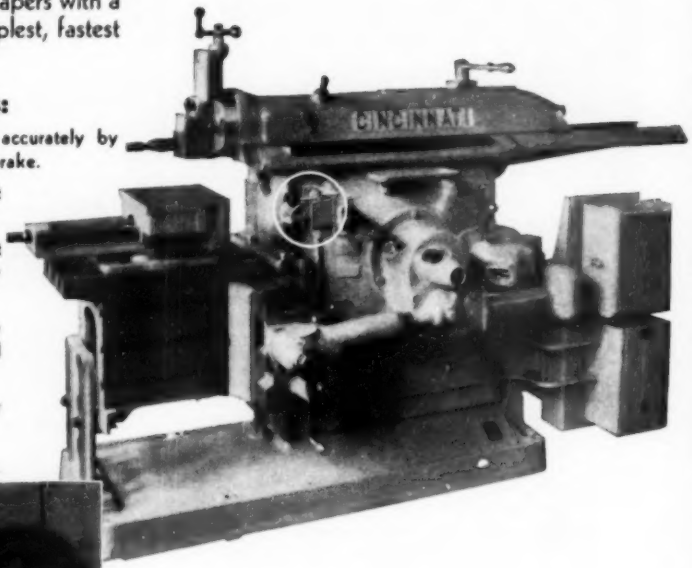

This clutch and brake are standard on all new Cincinnati Shapers. They are Warner units which have been thoroughly proven on machine tools.

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THE CINCINNATI SHAPER CO.

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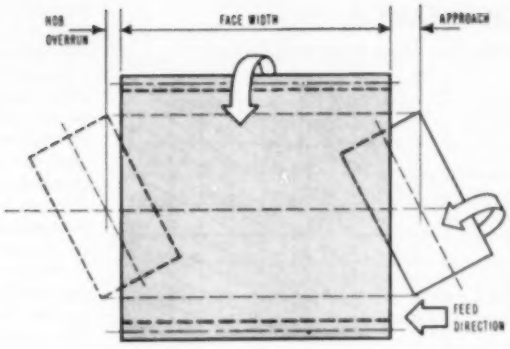


Fig. 1 . . . Total hob travel is made up of three factors: approach, face width, and overrun. The face width is always known, from the drawing, but the two other factors must be calculated

how to

ESTIMATE HOBBING TIME

Production rates and manufacturing costs must be figured out ahead if schedules are to be met and budgets maintained. Here is a step-by-step method of getting a close estimate on gear-hobbing time

BY STUART J. JOHNSON, hob engineer, and PETER R. NOLING, machine-tool engineer, BARBER-COLMAN CO.

In any machining operation, an estimate of cost in advance of production is of prime concern. As applied to hobbing, the production estimate is required: (1) To provide production figures from which the cost of the part may be determined, and (2) to ascertain the number of hobbing machines required for the production schedule established.

When applying the production estimate to the hobbing of gear teeth, many variables must be taken into consideration. If their existence is appreciated and they are properly applied, the estimate should be fairly reliable.

Feeds and Speeds

As with most machining operations, a number of factors influence the optimum speed-feed combination. In hobbing gears, these factors include (1) material being hobbed, (2) finish, (3) accuracy, (4) machine capacity, (5) hob specifications, and (6) tool life. In most cases, finish and accuracy are established items. The problem is to determine a hob speed and feed for a given hob and machine capacity that will produce the established finish and accuracy at a given production rate with justifiable tool life.

Available information for determining hob speed and feed for a specific job is found in past performance records, test data, and published articles. Undoubtedly, reliable past performance records are the best fingertip source of information. Of course, consideration should be given to improved design and techniques which may promote equivalent or even better results. For a more rigorous approach to the problem, a test, under conditions identical with those to exist in production, should indicate the feed and speed which will best produce the desired results.

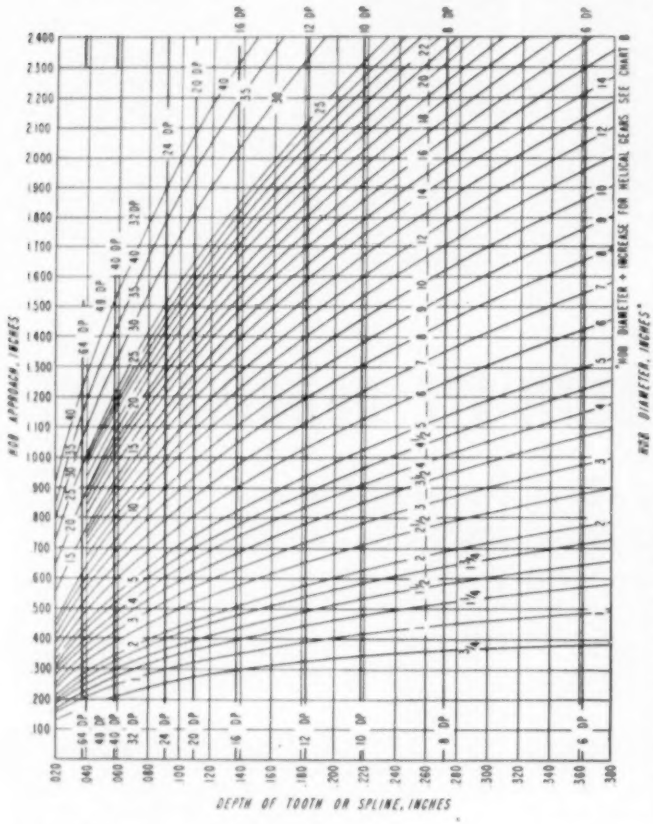
Basic Formula

The actual computation connected with finding the time required to hob a given gear in previously selected quantities is relatively simple. Selection of the quantities to be used, however, presents a problem that requires for its solution broad past experience, tempered with thoughtful consideration of the particular job.

In the mathematical expression used in calculating hobbing time estimates it is necessary, first of all, to investigate each quantity in the expression. Basically, the expression is the linear

HOB APPROACH CHART A

SPUR GEARS AND SPLINES (See Chart B for Helical Gears)


HOB APPROACH, INCHES
DEPTH OF TOOTH OR SPLINE, INCHES
HOB DIAMETER, INCHES*
*HOB DIAMETER + INCREASE FOR HELICAL GEARS SEE CHART B

distance traversed by the hob carriage on the machine bed-ways, divided by the velocity of the hob carriage, or

$$\text{Hobbing Time (min.)} = \frac{\frac{N}{t} \times L}{(\text{rpm})_a \times (f \cos A \times \%)}$$

where, $\frac{N}{t}$ = No. teeth on gear / No. thrds on hob

L = Total hob-carriage travel (in.) Refer to Fig. 1.

$(\text{rpm})_a$ = Hob speed (rev /min.)

A = Angle of helix

% = percentage multiplier for reducing f when multiple-thread hob is being used.

f = feed (in. of axial travel / rev of work spindle) for a spur gear using a single-thread hob

Inspection of the above equation shows that the numerator contains quantities known from data, physical dimensions, and geometric relationships. The denominator comprises items to be selected from past experiences or data applicable to the specific job. By breaking down the numerator and denominator, each item can be studied.

Numerator

Number of teeth on gear:—The number of teeth to be hobbed is a known quantity which should appear on the part print, together with the diametral pitch and outside diameter, which require consideration in selecting the machine. When small numbers of teeth are to be hobbed, check the index worm speed. This should not exceed the maximum speed recommended by the manufacturer of the machine.

Number of threads on hob:—One of the numerous factors that require consideration when designing the hob best suited for the job is the number of threads. From the equation, it will be seen that, all else being equal, increasing the number of threads on the hob decreases the N/t ratio, thus decreasing the numerator. A reduction in the numerator would indicate a reduction in hobbing time. However, the effect of the change in the feed and speed normally required when using a multi-thread hob must also be considered.

Total hob carriage travel—The total length of hob carriage travel to complete generation is divided into three parts: approach, face width, and overrun, as shown in Fig. 1.

Hob approach is the distance from initial hob-blank contact (Point *A*), to the point where the hob first cuts at full depth. It has a geometric relationship that has been plotted in Charts *A* and *B*. This distance varies with the hob dia, work dia, depth of cut, and hob swivel setting angle.

When the swivel setting angle is small, as often is the case for spur gears and splines, only Chart *A* need be used. Find the approach distance by following the curve corresponding to the hob dia until it intersects the tooth-depth line, and read the approach by following the vertical line which contains that intersection point. For a hob that has been resharpened considerably, consider the decrease in diameter.

For the larger swivel setting angles that usually exist in helical gear hobbing, the actual hob dia must be increased by a certain number prior to applying Chart *A*. Setting the hob at an angle has the same general effect as increasing the hob dia. Use Chart *B* to find the

number required. Determine the point at which the sum of the hob and gear dia intersects the line representing the swivel angle setting, and read the number at the left of the chart. Add this number to the hob dia and use Chart *A*.

If the sum of the hob dia and work is greater than the sums shown in Chart *B*, take half the sum of the hob and gear dia, find the number on the chart, and double the answer.

The gear face-width dimension represents the linear hob-carriage travel for full-depth cutting. Obviously, where more than one blank per load is to be hobbed, the full-depth length must be in agreement with the number of blanks. The approach distance plus the face width places the hob relative to the gear so full-depth hobbing has been completed, but total generation is unfinished. Often, with a small or zero swivel angle, the overrun (Fig. 1) is not considered in the estimate, the total linear hob travel being the sum of the approach and face width.

Hob overrun, distance *CD* (Fig. 1) is the linear hob carriage travel beyond full depth cutting that is required to complete generation. For helical gear hobbing where the hob swivel angle settings are usually large, the overrun should be calculated and added to the approach and face width to obtain the total hob carriage travel. A practical on-the-job formula that has been checked by test and gives safe, full generating results is

$$\text{Hob overrun} = \frac{s \cos A \tan H}{\tan PA}$$

where, s = dedendum of gear (in.) (s + f on hob)
A = angle of helix (deg)
H = hob swivel angle (deg)
PA = pressure angle (deg)

The total hob carriage travel, L, multiplied by the N/t ratio, completes the numerator of the equation for estimating hobbing time.

Denominator

Hob rpm—The hob rpm found from the sfpm established for the material to be hobbed and the hob dia. The relationship is:

$$rpm_H = \frac{12\ sfpm}{\pi D}$$

where, rpm_H = hob speed (rev/min)
$sfpm_H$ = peripheral speed of hob (ft/min)
π = 3.141593
D = hob dia (in.)

To establish the sfpm required to solve the above equation, a knowledge of material machinability, as applied to hobbing, is useful. The following table, based upon diametral pitch and 100% machinability rating (AISI 1112 cold-drawn steel), provides a starting point in determining a satisfactory sfpm.

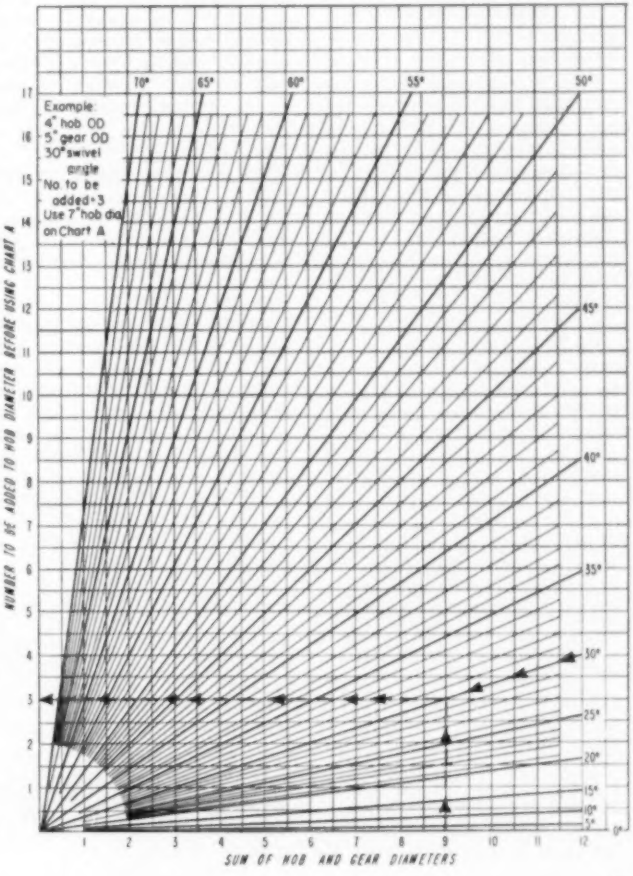
DP	*sfpm (100% machinable)*
1-16	180
16-32	200
32-finer	220

To find the sfpm for a specific material, multiply the applicable sfpm given above by the machinability rating of the material. Machinability ratings may be found in published articles and from performance records accumulated from past experience.

Because the number of hob speeds on the machine is limited, the actual hob rpm will necessarily be the closest available. Again

AUXILIARY HOB APPROACH CHART B

HELICAL GEARS (Use Chart A after increasing Hob Diameter)



check the index worm speed by applying the hob rpm, no. of threads on the hob, no. of teeth on the gear, and the index worm and wormwheel ratio in the machine.

Feed = $f \cos A \times \%$

Before discussing feed selection, consider the complete production equation in terms of constant conditions, fixed variables and dependent variables as given below:

Constant Conditions

Gear-blank material
Gear configuration
Finish desired
Accuracy desired

Fixed Variables

Machine capacity
Rigidity of workholding device
Hob design
Feed and speed

Dependent Variables

Tool life
Production rate

In the above breakdown, part print data are taken as the constant conditions to be held; the fixed variables include design features established for the job, and the feed and speed applicable to the conditions existing. Under the dependent variables are the tool life resulting, and the production rate which will determine the number of machines needed to meet the production schedule.

To be classified as a fixed variable, a number of factors should be considered in the selection of '*f*'. The feed per revolution of the work spindle, *f*, is the selected feed when applied to a single-thread hob, a spur gear, known machine capacity, known blank material, and a fixed class of finish. Under these given restrictions, the magnitude of *f* is found from past performance records and test data. Records and data of this nature are generally available to hobbing machine builders and those connected with gear production. No suggested means for finding *f* is given in this article because too many variables influence its selection.

For spur gears, the cos *A* quantity is 1 as the helix angle is zero. However, with a helical gear, and where it is desired to keep the feed marks similar to those obtained for a spur gear, the feed *f*, is multiplied by the cosine of the helix angle. The axial feed then will be *f* cos *A*, and '*f*' will be the feed along the helices.

To apply a multiple-thread hob to the feed portion of the estimate equation, a percentage term is used. A prime factor in establishing this percentage is tooth loading, which is a function of hob design. For the single-thread hob, this term is 100%. A figure of from 60 to 80% is suitable for a 2-thread hob and from 40 to 60% for a 3-thread hob.

With the feed and related quantities established, the denominator is complete. The answer found from the equation gives the time required for cutting the part. Added to this cutting time should be a handling time which is influenced by the workholding device and the factors affecting material handling. This sum gives the total time per cycle. Dividing this sum by the number of blanks per load gives the total time per piece at 100% efficiency.

To determine the production rate, a 51-min. hour divided by the time per piece is commonly used. The 51-min. hour assumes an efficiency of 85% in the hobbing operation.

The foregoing discussion has been concerned with the time required to hob and handle a gear part. As an estimate, the results obtained depend largely on past experience with hobbing and application of available information. The speed-feed combination selected may not be the best for the many variables considered. However, as with most estimates, optimum conditions are reached by operational test work.

Example Problems

Gear Data

8 normal DP, 14½° normal PA
50 teeth, 7.602-in. OD
31°48′37″ R/H helix angle
1.125-in. face width
Alloy CI (nickel-chromium-moly)

Hob Data

8 normal DP, 14½° normal P/A
Single-thread R/H, Finishing
0.270-in. cutting depth
0.145-in. S + F
3x3x1¼-in. bore
2°39′ thread angle

Machine Data

Barber-Colman No. 16-16 Hobbing Machine (New)

Tooling Data

Bayonet-type work-arbor assembly for 4 pc per load. End to end (no hubs)

$$\text{Hobbing Time} = \frac{(N)}{(t) \times L} \times \frac{1}{(\text{rpm})_H \times (f \cos A \times \%)}$$

$$\frac{(N)}{t} = \frac{50}{1}$$

L = Approach + face width + overrun. Approach = Sum of hob and gear dia
7.6 + 3.0 = 10.6
Swivel angle = gear angle − hob angle (both R H)
= 31°48′37″ − 2°39′ = 29°9′37″
From Chart *B*, No. to be added to hob dia = 3.3
Add 3.3 + 3.0 = 6.3
Use Chart *A* to find approach
Approach = 1.29 in.

Face width = 4 x 1.125 = 4.500″

$$\text{Overrun} = \frac{S \cos A \tan H}{\tan P A}$$

S = 0.145 in., A = 31°48′37″
Cos A = 0.8498
H = 29°9′37″, Tan H = 0.5580
PA = 14½° Tan PA = 0.2586

$$\text{Overrun} = \frac{0.06875}{0.2586} = 0.266 \text{ in.}$$

L = 1.29 + 4.50 + 0.27
L = 6.06 in.

$$\text{Hob rpm} = \frac{12 \text{ sfm}}{D}$$

Machinability of gear material, from published tables = 50%

$$\text{rpm} = \frac{12 \times (180 \times 0.50)}{3.14 \times 3}$$

rpm = 114
Closest available speed on No. 16-16 B-C machine is 120 rpm

Feed = f Cos A x %
f—for CI spur gear, on a new 16-16 machine with a 3-in. dia finishing hob, the feed should be about 0.055 in. for the finish desired.
Cos A = 0.8498 (See overrun)
% = 100 for 1-thrd hob
Feed = 0.055 x .8498 x 1.00
= 0.047 ipr.

$$\text{Hobbing Time} = \frac{(50)}{1} \times \frac{6.06}{120 \times 0.047}$$

$$= 54 \text{ min.}$$

Handling time = 1.0 min.

Cycle Time = Hobbing time + handling time

$$= 54 + 1.0$$

= 55 min. (4-blank load)

$$\frac{\text{min}}{\text{pc}} = \frac{55}{4} = 13.8$$

$$\text{Pieces per hour} = \frac{\text{Min/hr} \times \text{Eff}}{\text{Min/pc}}$$

$$\text{Pc/hr} = \frac{51}{13.8} \text{ @ } 85\% \text{ efficiency}$$

$$= 3.7$$

Example Using Multithread Hob

Considering the above example gear cut with a 3-thread preshave hob, we find the following items would change:

$t = 3$

Hob dia = 3¾ in.

Lead angle = 6° 17′

Depth = 0.286 in.

Hob S + F = .161 in.

f = .085 ipr

$\% = 50$

Approach = 1.33 in.

$$\text{Overrun} = \frac{(0.161)\ (0.8498)\ (0.4777)}{0.2586}$$

= 0.253 in.

$$\text{rpm} = \frac{(12)\ (180 \times 0.50)}{3.14 \times 3.75}$$

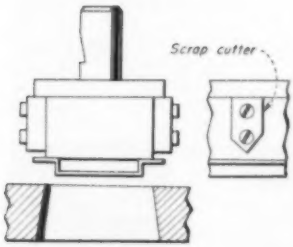
= 92. Use 99, which is nearest available rpm.

$$\text{Hobbing Time} = \frac{50\ (1.33 + 4.50 + 0.253)}{3 \times 99 \times (0.085 \times 0.8498 \times 0.50)}$$

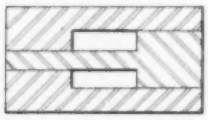
= 29 min.

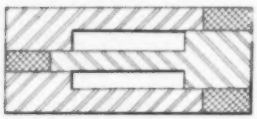
DIEMAKERS' KINKS

BY FEDERICO STRASSER



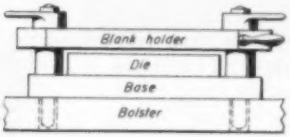
SCRAP CUTTERS applied to opposite sides of a trimming punch will sever the tightly adhering scrap ring into two halves. The press-ram stroke is adjusted so that there will be no contact between the cutters and the die plate.

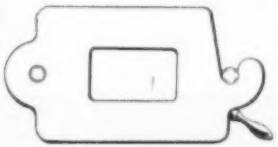




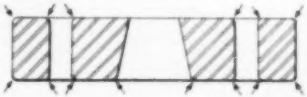
SECTIONAL DIES with filler blocks can be used to punch long or short slots. This feature will add to the advantages of such tools and reduce modification costs.

A PIVOTING PUNCH assists loading pre-drawn shells into a horizontal redrawing press. The die ring is of standard design.

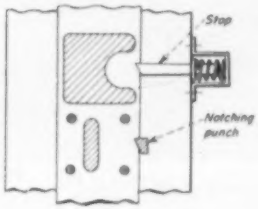




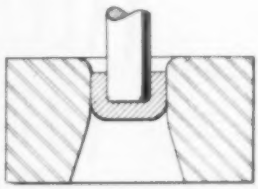
SCREW-ACTUATED hold-downs for simple drawing dies are convenient for short-run jobs. In operation, after the blank has been placed in its nest, the blank-holder is clamped by tightening two or more quick-acting clamps.



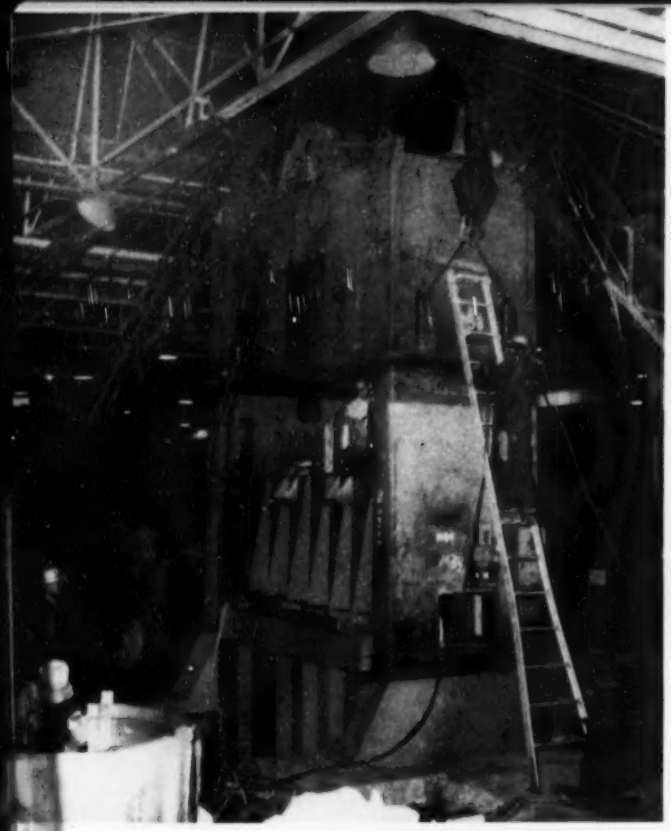
ALL OPENINGS in die plates should be rounded to minimize cracks in heat-treating. Of course, the exception is that cutting edges must be sharp.



AUTOMATIC STOPS for progressive dies must function effectively at high production rates. One good method is to use a notching punch that cuts a triangular-shaped notch in the edge of the strip at the first operation. At the second station, place a spring-actuated stop that fits the notch and registers the strip.



SMALL DRAWING DIES with bottom ejection should be made with a short straight land and the bottom part slightly tapered. Thus, the shells will not stick so tightly in the die that there is danger of punching out the bottom.



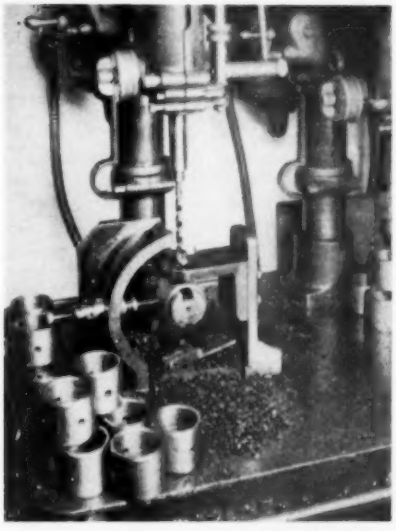
PRESS INSTALLATION

First of four Warco presses being located on steel piles 60 ft deep will stamp stainless-steel components for jet engines. *Ryan Aeronautical Corp.*

TALENTED ☆ TOOLING

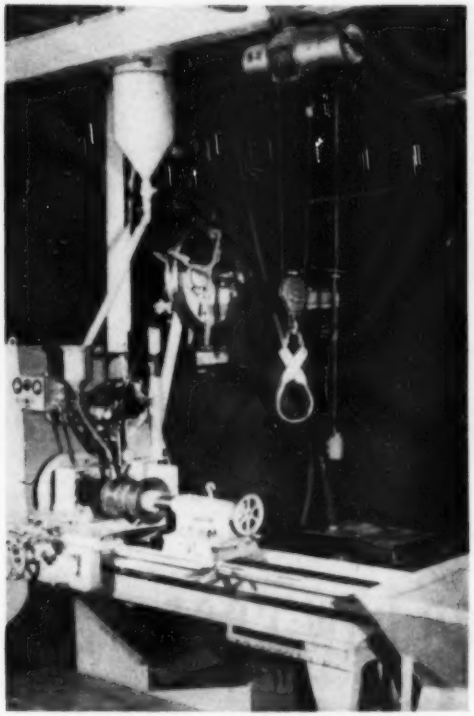
DRILLPRESS SANDER

Sand-O-Flex wheel smoothes drop-forged hubs to remove internal-chuck marks from previous turning and facing operations. Aluminum-oxide abrasive cloth finishes hubs in 20 sec to eliminate hand-rubbing. *Powell Mfg. Co.*



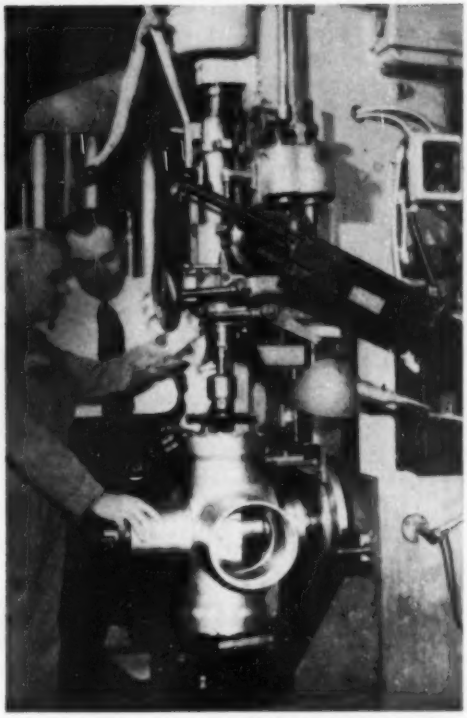
ANGLE JIG

Adjustment for drilling angled holes in 57 parts is provided by an arbor-holding bracket and quadrant on a Delta drillpress. Pin is clamped on quadrant, but is spring-loaded to slip into first drilled hole, thus locating work sleeve for second hole. Angles from about 15 to 160° can be set. *Reed-Prentice Corp.*



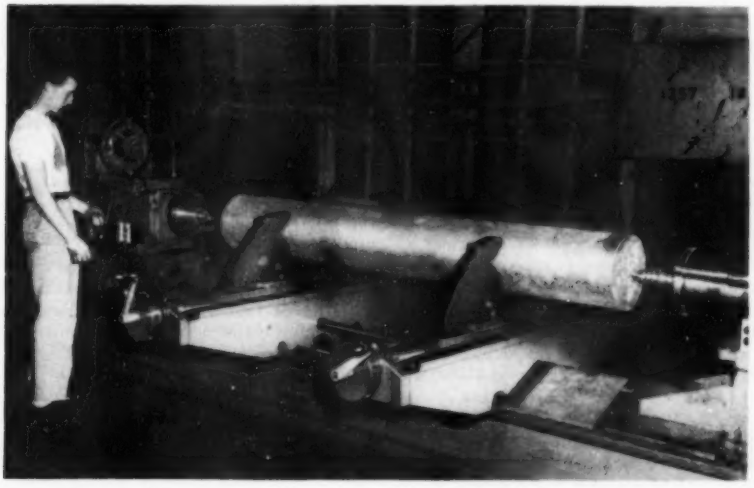
WELDING LATHE

Unionmelt head added to old lathe builds up worn tractor rolls, using lathe-head rotation to insure uniform weld-metal flow. Trough below carriage catches weld composition for salvage. Extended work center will hold large-dia rolls over tail end of lathe. Next operation is turning rolls to original contours



DRILLPRESS BRUSH

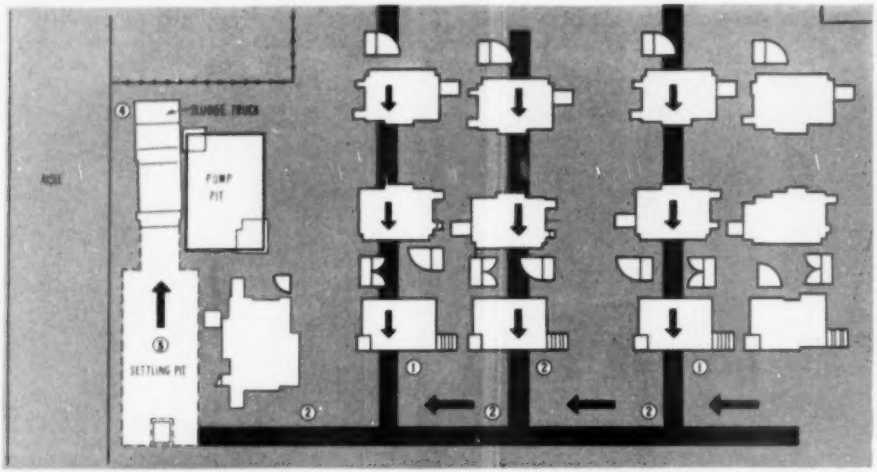
Osborne wire brush on drillpress spindle takes out metal fragments and improves finish of bearing area inside hubs for variable-pitch propellers, which have been previously shot-peened. Brush substitutes for hone; also cleans up thread next to bearing. Automatic timer controls hydraulic ram that raises and lowers spindle. *Curtiss-Wright Corp.*



CENTERING LATHE

Two Ex-Cell-O heads and two specially built carriages with self-centering V-notched jaws work on an old lathe bed to center and drill relief in the ends of rough shafts. Work capacity is 20 ft long, 20 in. dia. Clamping is manual, but carriage travel and cutting are automatic. *Marion Power Shovel Co.*

wet chips move to settling tank for clarification of coolant



Conveyor installation in crankshaft machining line is typical of systems installed in new Cleveland Engine Plant for handling steel chips and soluble oil. Conveyors beneath machines, (1), empty into main conveyor, (2), which carries chips and oil to gravity settling tanks, (3). Clean oil returns to machines. Flight conveyor scrapes chips from tank into waiting trailer, (4). System eliminates manual handling from chip-removal operations

HOW FORD PLANS FOR LOW-COST CHIP

Latest cost-cutting ideas developed by Ford engineers for chip handling and coolant purification are found in the new Cleveland Engine Plant. Cast-iron chips, wet steel chips, and grinding sludge are handled in well-planned systems that often depart from conventional practice to obtain greater effectiveness in operation

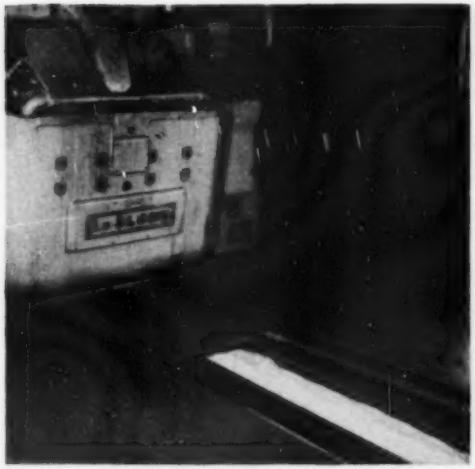
BY MILES J. ROWAN, ASSOCIATE EDITOR

Features of the chip-handling operation in Ford's new Cleveland engine plant include: detailed planning in advance to provide a complete chip-handling system that is an integral part of the plant layout; provision of a Ford-specified chip conveyor in every machine that produces more than 40 lb of chips per day; selection of oscillating conveyors as the standard method of handling, both from the machines and along main feeders; checking of every machine tool in advance to insure base openings large enough for installation of an oscillating conveyor; purification of soluble-oil coolants without filtration; and modification of a standard filtering system for lower-cost operation in the purification of grinding coolants. All of these things add up to chip handling at minimum cost and without interference to production operations.

Planned for production of the new six-cylinder Ford engine and the new Mercury 8, the new plant contains a wide variety of chip-handling conditions. Some machines are large transfer types, while others are conventional single-operation units. In some cases, machines are arranged in a product-line setup, in others a number of like machines are grouped in a single area. Many of the chips are dry, while others are mixed with soluble-oil coolants. Yet, despite this variability, all chip-handling is performed with one basic conveyor, and the over-all system of the plant consists of a number of relatively simple independent installations that could readily be applied in any number of metal-working plants.

How Does the System Work?

The basic plan is to provide chip conveyors in each individual machine that produces more than 40 lb of chips per day. These conveyors, in turn, feed a main conveyor running to an area collection station conveniently located on the main plant aisle. From this point, chips are picked up by tractors normally operating in the area.



Conveyor beneath the machine carries chips and coolant from three crankshaft lathes to main conveyor. Underfloor location avoids danger of conveyor interfering with movements of material and personnel. Cover plate was removed for picture

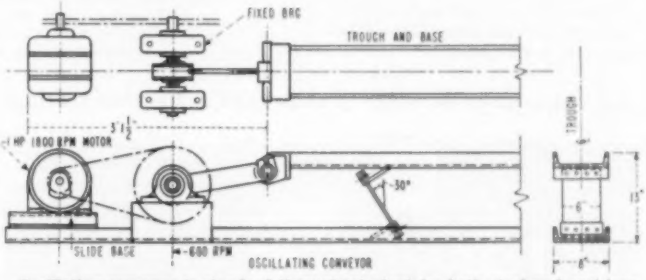
Chutes in base of machine (rear view) direct chips and coolant into conveyor. Machine was checked before purchase to make sure that its design would permit application of this type of conveyor installation for removal of chips and coolant

HANDLING

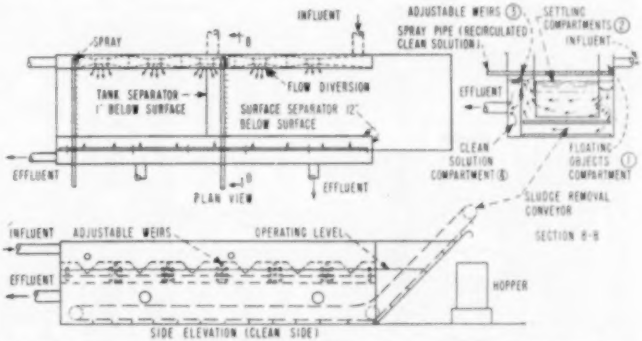
All main conveyors are located just below floor level. This permits continuous operation with no interference to the movement of material or personnel. At the collection stations, hoists or inclined conveyors move chips into round, tilt-hopper trucks. No manual handling is required, except on those machines that take light finishing cuts and produce less than 40 lb of chips per day. In this case, handlers remove the chips manually and transport them to the area collection stations.

Oscillating Conveyors are Used

Conveyors selected for all chip handling throughout the machining areas are standard oscillating conveyors produced by Link-Belt. Simple, yet rugged in construction, these conveyors have fewer moving parts and required a lower initial investment than any other type suitable for the job. All main conveyors and the majority of the machine conveyors are of this type. Each machine tool was checked be-



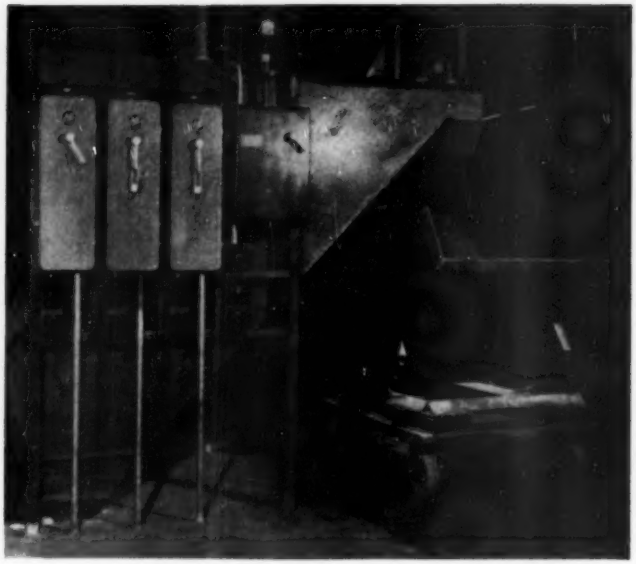
Oscillating conveyor is standard throughout plant for both steel and cast-iron chips. Oscillating support member is plastic, and is driven by eccentric at its natural frequency of vibration. At right is shown standard opening required in base of all machines to accommodate conveyor



Gravity settling system for recirculated coolant brings dirty coolant into compartment (1), where some solids drop out. Coolant flows into compartment (2), where more solids settle out, and then over V-notch adjustable weirs into clean compartment (4). Minimum retention time is approximately 5 min. Solid removal is better than 90%. Conveyors remove sludge and scum

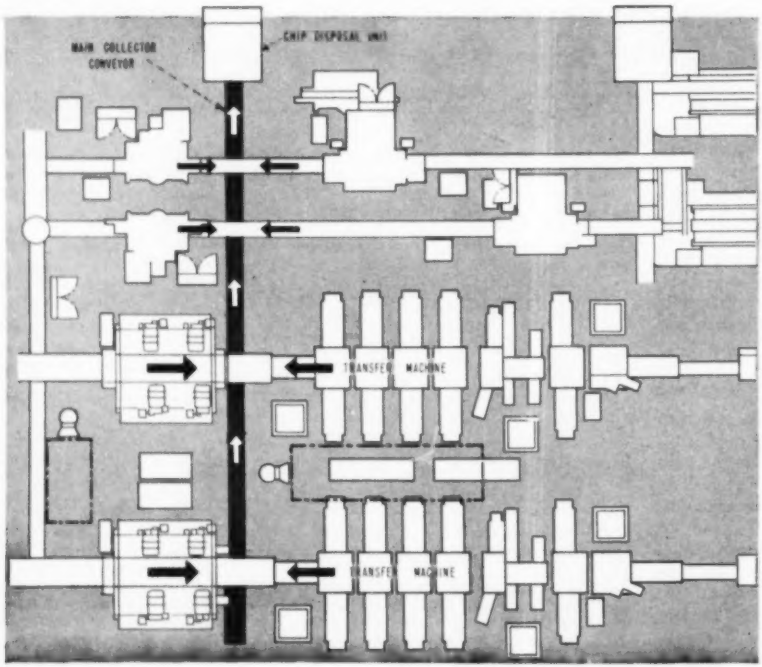
fore purchase to make sure there was sufficient room in the base for installation of the conveyor. Where practical, even those machines normally furnished by the manufacturer with built-in chip conveyors, were obtained with oscillating conveyors. In all cases, machine-tool manufacturers furnished conveyors with their machines and all conveyors were built to Ford specs.

The standard machine conveyor is approximately 8 in. wide by 12 in. high and, in some cases, base castings of machine tools were changed to provide the 10-in. x 13-in. opening required for installation of the conveyor. Base castings also were checked, and changed if necessary, to permit proper chuting of chips from the tools to the conveyor. In each case, the length of the conveyor was determined by the location of the machine relative to the main conveyor. All machine conveyors extend far enough from the base of the machine to deliver chips to the main conveyor without intermediate bridging.



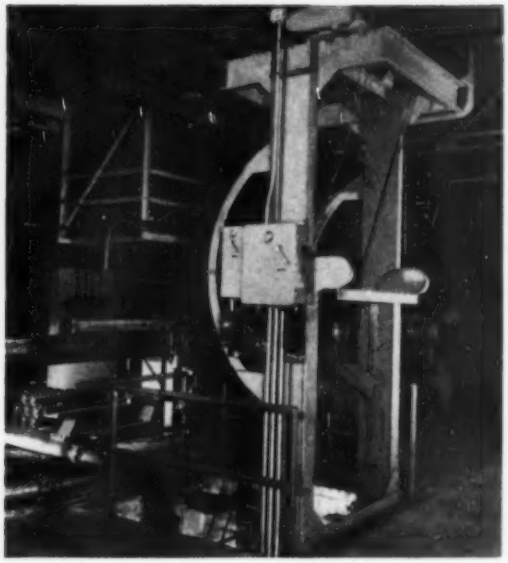
Discharge end of system employs flight conveyor to remove chips from underground settling tank. Chip cart is towed by tractor to chip house. Panel holds controls for chip conveyor and central coolant system

dry chips move directly to skip-hoist collection stations



Conveyors in production setup for block-machining operations move cast-iron chips to chip disposal unit on aisle. Location of main conveyors is planned so individual machine conveyors feed in at right angles above main conveyor. Arrows show chip flow. Area is fully automated (*AM*—Mar. 17, '52, p 135), with chip conveyors located beneath automation units

Cast-iron chips are moved to main conveyor by standard oscillating conveyor located in base of each machine tool. Conveyor delivers chips to 2-cu-yd hopper in pit of collection station located on aisle



Skip hoist raises hopper from pit and dump chips into truck that collects chips periodically. Microswitch stops conveyors during dumping of hopper. Electric eye sounds warning alarm when hopper is nearly full

The location of the main conveyors and the number of machines served by each was determined by the plant layout and the number of pounds of chips produced by each machine. Main conveyors range from 22 to 125 ft in length, and will carry anywhere from 64 up to 2400 lb of chips per hour. Each main conveyor, with its individual machine conveyors, is a system in itself, and is completely independent of the others. Thus, all chip-removal needs on which it is practical to use power handling are met by a series of relatively simple conveyor installations that operate in conjunction with other mechanized equipment required to complete the system.

Dry Cast-Iron Chips

Cast-iron chips are delivered by the main conveyor to a collection station equipped with a specially designed skip hoist. Chips drop continuously into a hopper in the hoist pit. Periodically, truckers moving along the aisle operate the hoist to lift the hopper from the pit and automatically dump the chips into the waiting truck. Chips then are taken to the chip house where they are briquetted for subsequent use in the plant foundry.

Wet Steel Chips

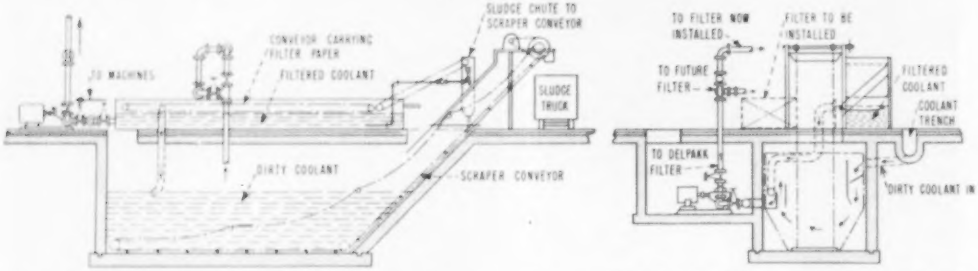
Steel chips produced in soluble-oil coolant are conveyed in much the same way as cast-iron chips. Both chips and coolant drop from machines to oscillating conveyors below the floor. Chips and coolant then are carried in main line conveyors to settling tanks located near the main plant aisles. Here gravity settling for 6 to 8 min. separates chips and coolant. Flight conveyors scrape the bottom of the tank continuously and elevate chips to dump trucks waiting at the discharge point on the floor level. Coolant returns to the machine through a central pumping system. In this system, the top channel of the conveyor acts as a flume to carry coolant as well as chips. The size of the top channel varies, therefore, depending upon the amount of coolant being pumped.

Purification of Coolant

The system for steel chips and soluble-oil coolants eliminates filtration of coolant and was adopted only after careful study of results obtained from a pilot installation in another plant of the company. The initial study was made on a Ford-designed system made up of three settling tanks and processing 825 gpm. Coolant and chips flowed into a center tank where initial removal of floating scum and solids was accomplished. Spray jets above the surface washed scum to one end, where a continuous scraper removed both solids and scum from the tank. The flow then divided, one-half going to one tank, and one-half to another for further settling and clarification of the oil to allow re-use.

Tests show that the theoretical retention time in each unit was 4 min.; that 50% of the flow had a retention time of one minute, while portions of the remaining 50% had retention times varying from 1 to 7 min. With these times, approximately 90% of the total incoming

combined settling and filtering cleans coolant for precision grinding



Complete filter system consists of settling tank plus filter unit. Dirty coolant enters tank where most of solids settle out. Coolant then is pumped to filter, where high degree of clarification is obtained. Scum and solids are removed, and, as aeration of coolant is excellent, danger of spoilage of coolant is reduced. This unit, required for grinding aluminum pistons, is the only filter application in the entire Cleveland Engine Plant

solids were removed. The second and third tanks accomplished little in the way of solid or scum removal.

In the Cleveland plant, therefore, clarification of soluble oil is accomplished by gravity settling in a single tank. The design provides a minimum retention time of 5 min. The tank length is approximately four times its width and the coolant depth is between 4 and 5 ft. Details of the tank are shown in the accompanying illustration.

Grinding Sludge

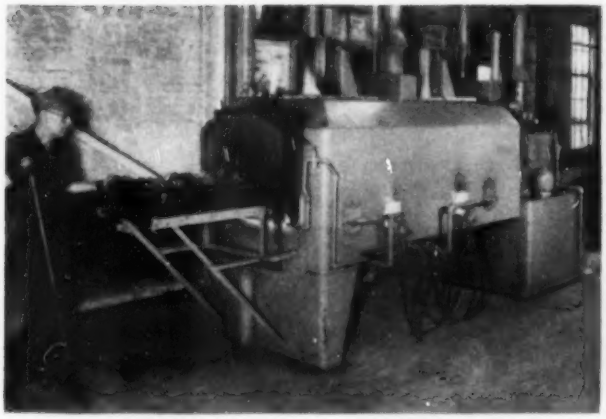
While not actually chip-handling, another related problem is the removal of grinding sludge and clarification of the coolant. In precision grinding, the degree of clarification of the coolant has an important bearing on the quality of the work produced and on wheel life.

At the Cleveland plant, excellent results in the grinding of pistons have been obtained by centralized clarification of coolants in a modified Delpark filter system. Scrap has been reduced, surface finish improved, and it is estimated that wheel life has increased approximately 20%.

The Delpark unit consists of a tank equipped with a steel-mesh conveyor that supports filter paper unrolled from one end of the unit. Dirty coolant pours onto the paper and filters through to a reservoir below. As the sludge builds up on the paper, the coolant level rises, actuating a float that drives the conveyor to bring a clean section of paper into action. Sludge and paper are discarded, and the coolant is pumped back to the grinders.

While this method has proved an advantage on close-tolerance jobs where clarity of coolant is important, cost may run higher than other filtration methods, unless close control is maintained over the amount of filter paper used. To hold this cost to a minimum, Ford employs gravity settling in conjunction with the filtration unit. All sludge first is sluiced into an underground tank where it remains for approximately four minutes. This removes the greater portion of the sludge. Partially clarified coolant then is introduced into the Delpark filter unit, where it goes through the normal filtering procedure. The modified system produces the desired high degree of filtration, yet holds costs of operating and maintenance to an acceptable level.

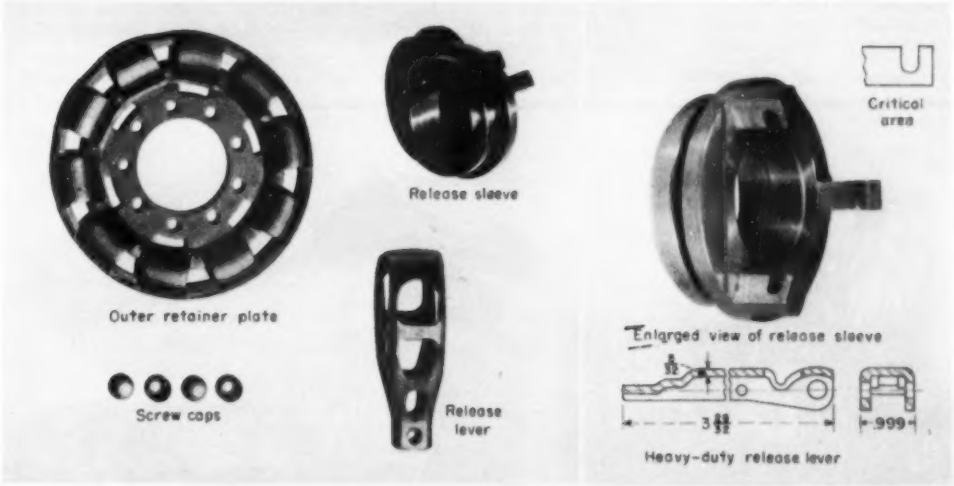
YOU HAVE WASTED FOUR MAN HOURS LOOKIN' FOR THIS PULLEY YOU SENT TO THIS DUMP A YEAR AGO - FOUR HOURS OR $8.10! A NEW ONE COSTS $1.17! YOU'VE SPOILED MY DAY - RUINED THAT CHEAP SUIT YOU'RE WEARIN' AN - IN A CLUMSY SORT O' WAY - YOU'RE MASHIN' MY FOOT!
ACID
"PROHIBITIVE COST OF THRIFT"



Tray holds up to 275 lb of work

Distortion of retainer plates: ± 0.001 in.

This Furnace Processes These Parts



Versatility in heat-treating method and work-size accommodation is required by the Rockford Clutch Div., Borg-Warner Corp. By installing an Ipsen Industries automatic-cycle, controlled-atmosphere furnace, metal stampings and machined parts are carbonitrited up to 2½ times faster than the former method of liquid cyaniding. Hardness and distortion variables from batch to batch are no longer factors.

To handle a load, the operator places the parts in a basket or tray, puts the tray in the furnace, sets the controls, and goes about other business until the end of the automatic cycle. Rockford uses the furnace mostly for carbonitriting, but the equipment will handle carburizing, clean hardening, brazing, and marquenching by adjusting the controls and gas generator. Work produced is always clean, bright, and scale-free. Two-speed agitation and temperature control of quenching oil are available.

Results on SAE 1010 articles are:

Outer release plate—case depth, 0.004-0.005 in.; distortion held to 0.001 in.; hardness, A80-81 (file hard); production, 10,000 pcs in 10 hr; cycle, 70 min.

Release sleeve—case depth, 0.012 in.; load, 150 pcs.

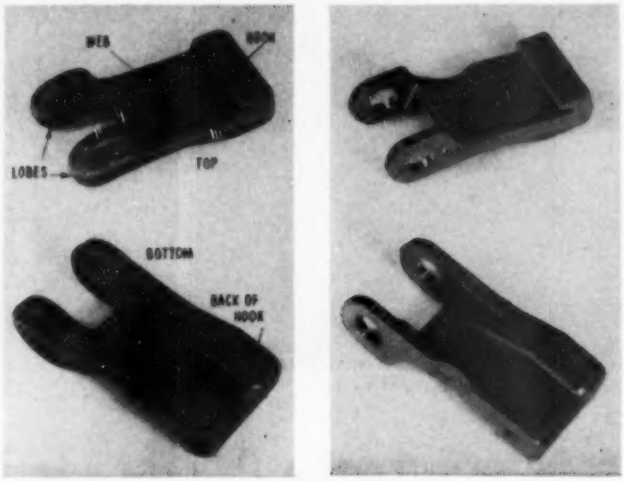
Small screw cap—case depth 0.003 in.; load, 275 lb.

Release lever—case depth on light type, 0.012.; case depth on heavy type, 0.023 in.; cycle time, 2 hr, 50 min.

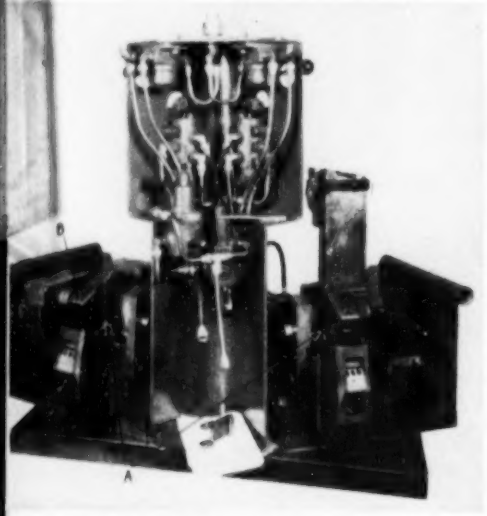
BROACHING MAKES AN ANCHOR

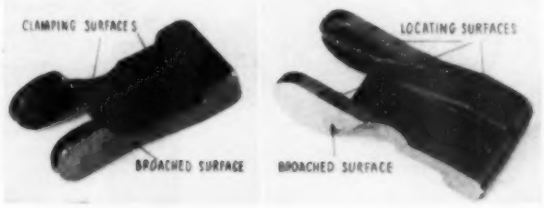
Ingenious fixtures are the key to high production, low cost, and high quality in manufacturing parts for a torque-converter transmission

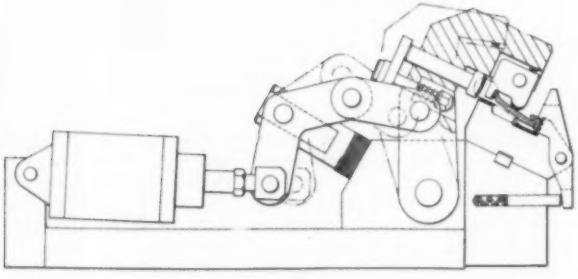
BY JOSEPH A. PSENKA,
Broach Engineer
NATIONAL BROACH & MACHINE CO.



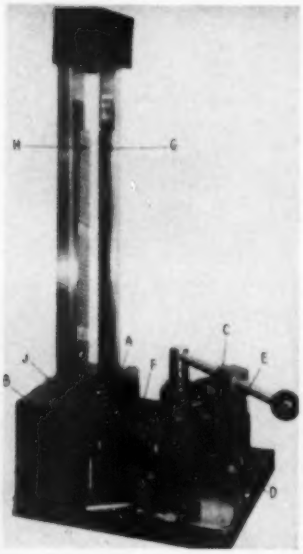
Reverse brake-band anchor for torque-converter transmission is forged from SAE 5140 steel. It is 3.58 in. long, and 1.64 in wide, and weighs 11.4 oz in the rough, 9 oz finished. Of the seven operations needed to complete the part, five are performed by broaching. The remaining two are drilling and diamond-boring the holes. All broaching fixtures were designed and built by National Broach & Machine Co

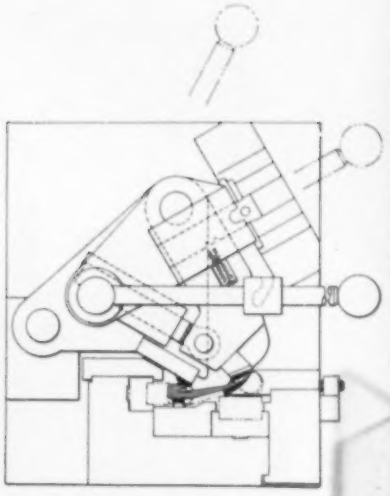






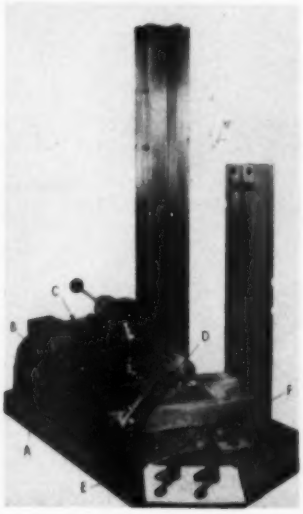
2ND OPERATION consists of broaching both sides and a clearance radius. Stock removal is $\frac{1}{8}$ in. approx, speed is 29 fpm, and production rate is 105 pieces per hr. Tool life is 4000 pieces per grind. Work *A* is held in two inner fixtures shown. Outer fixtures are used for operation 4. Machine is 10-66 Duplex vertical Cincinnati. As work is placed in fixture, a spring-loaded V-plunger wedges between lobes to centralize it and force qualified hook end against bottom stop. Clamping block *C* has equalizer to bear on end and face of web. Air cylinder with toggle linkage forces V-plunger forward and at the same time forces top clamping block downward onto the web

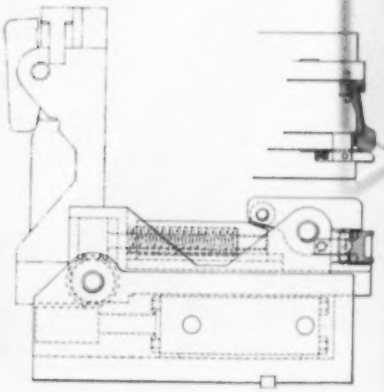




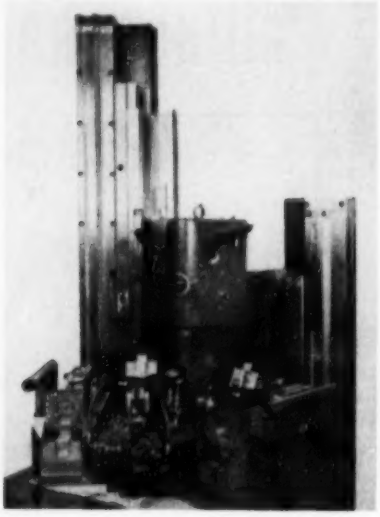
1ST OPERATION qualifies back end of hook and lower edges of lobes for locating surfaces. Stock removal is 1/16 in. approx from each surface. Speed is 29 fpm, and production is 105 pieces per hr. Tool life is 9000 to 10,000 pieces per grind. Work is supported on posts *A*, against locating block *B*. Lever assembly *C* is moved to left to advance clamping fingers *F*. When assembly registers with notch *D*, bolt *E* is released and engages the notch. Further movement of lever *I* actuates secondary linkage which, by means of a cone lock, applies sufficient pressure to work to prevent displacement during broaching stroke. Broach *G* cuts end of hook, and broach *H* cuts lower edges of lobes. Broaches are supported by guide towers *J* because the Colonial VBS4-24 press has no tool guides

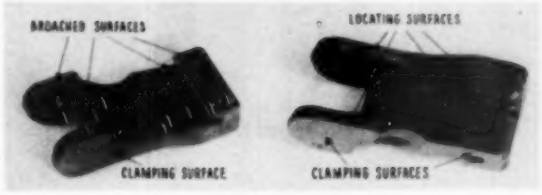
PLEASE TURN PAGE

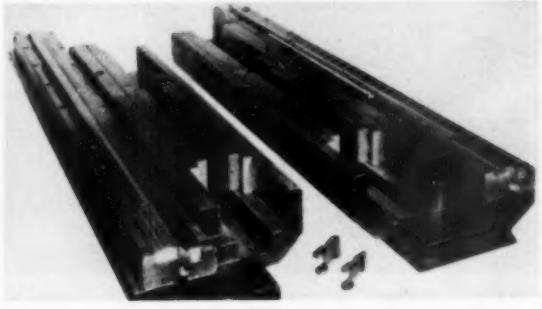




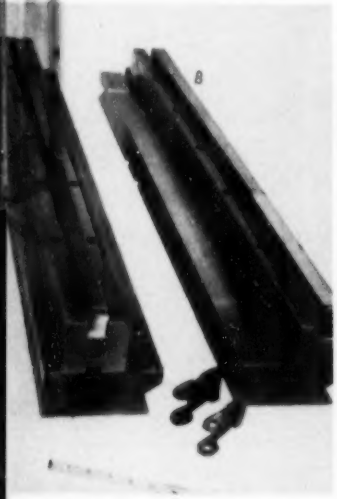
3RD OPERATION involves rough broaching the hook slot and the forward edge of the hook, and finish broaching the blending of the hook slot and the forging surface. Slot is roughed to a depth of 0.135 in., speed is 29 fpm, production 105 pieces per hr. Tool life is 4000 per grind. Fixture, shown at left in photograph, has hydraulic cylinder in base which moves rack *A* in mesh with gear *B* mounted in base. A shorter rack integral with loading arm *C* also meshes with this gear and swings upward around its axis. As piston moves away from broach it rotates the gear and raises loading arm to vertical position; spring is compressed and wedge block retracted to permit removing and reloading the work. When piston moves back, spring is released, clamping the work, and the loading arm lowered to broaching position. Further movement of piston, with arm horizontal, exerts additional clamping pressure

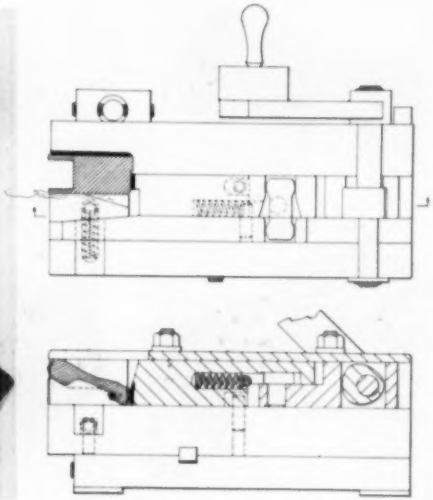




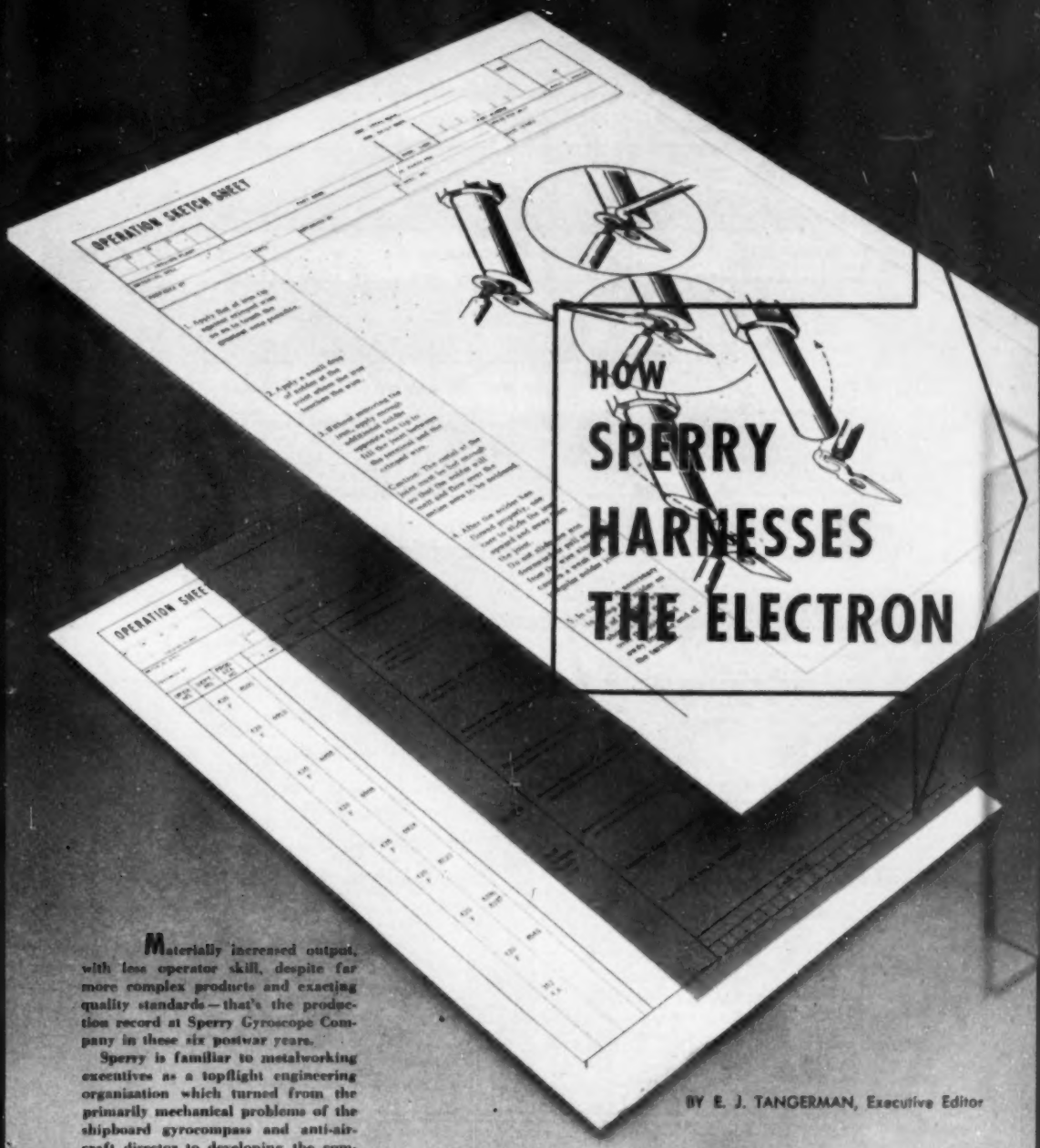


4TH OPERATION consists of finish-broaching the hook slot and surfaces rough-broached in operation 3, plus broaching two processing flats on the lobes to be used as locating surfaces for drilling and boring the lobes in operations 6 and 7. The fixtures are the two outside ones shown in the illustration, and are similar to those used for operation 3. The work is done in a 10-66 Cincinnati Duplex at a speed of 29 fpm and a production rate of 105 per hr, with a tool life of 4000 per grind. Stock removal is 0.125 in. and a high finish is required on the inner surface of the slot. The main holders, sub-holders, and slab broach inserts for operations 2 and 4 are shown here





5TH OPERATION final broaching calls for finishing the inside surfaces of the lobes. The work is done on a 3-48 Cincinnati Duplex; stock removal is ¼ in., and speed and production are the same as in the preceding operation. The fixture, shown here and at right in Fig. 4, is hand-operated by the crank *D*. The cam advances a block carrying a pivoted equalizer, and because a spring is interposed in the main clamping block, the side clamping block exerts pressure first. This clamp operates by means of a sliding wedge. Further movement of the cam crank advances the main slide, and both are locked by the cam. Lateral adjustment of the fixture is effected by the screw *E*, and a chip trough *F* discharges chips and coolant. Broach *A* is for operation 3, *B* for operation 5



HOW SPERRY HARNESSES THE ELECTRON

Materially increased output, with less operator skill, despite far more complex products and exacting quality standards—that's the production record at Sperry Gyroscope Company in these six postwar years.

Sperry is familiar to metalworking executives as a topflight engineering organization which turned from the primarily mechanical problems of the shipboard gyrocompass and anti-aircraft director to developing the complex and hush-hush electronic equipment for our latest weapons—land, sea, and air. But little has been said of the concurrent manufacturing advances that have made it possible to convert a hand-built prototype into production quantities of top-quality products. Here in pictures and captions, we tell the story of production planning and quality control flexible enough to produce hundreds of different components each month, in widely varying quantities. We use as our example the wire-preparation cable and harness-assembly departments. Layout, production, planning (right on the shop floor), and methods engineering are evident all through this story of a mushrooming plant—moved to a new location and expanded even while this Special Report was being written.

BY E. J. TANGERMAN, Executive Editor

American Machinist SPECIAL REPORT NO. 305 TO THE METALWORKING INDUSTRIES

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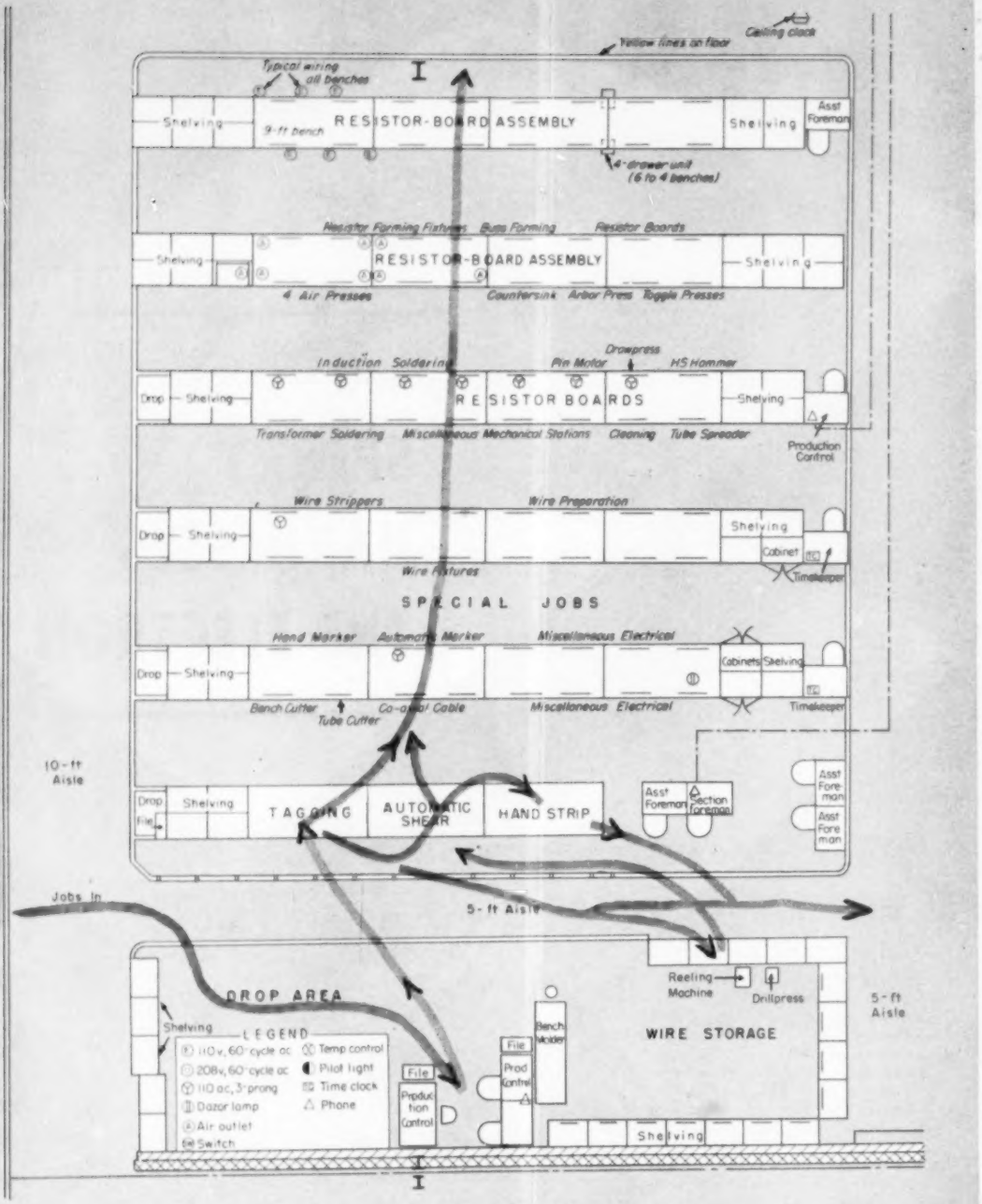
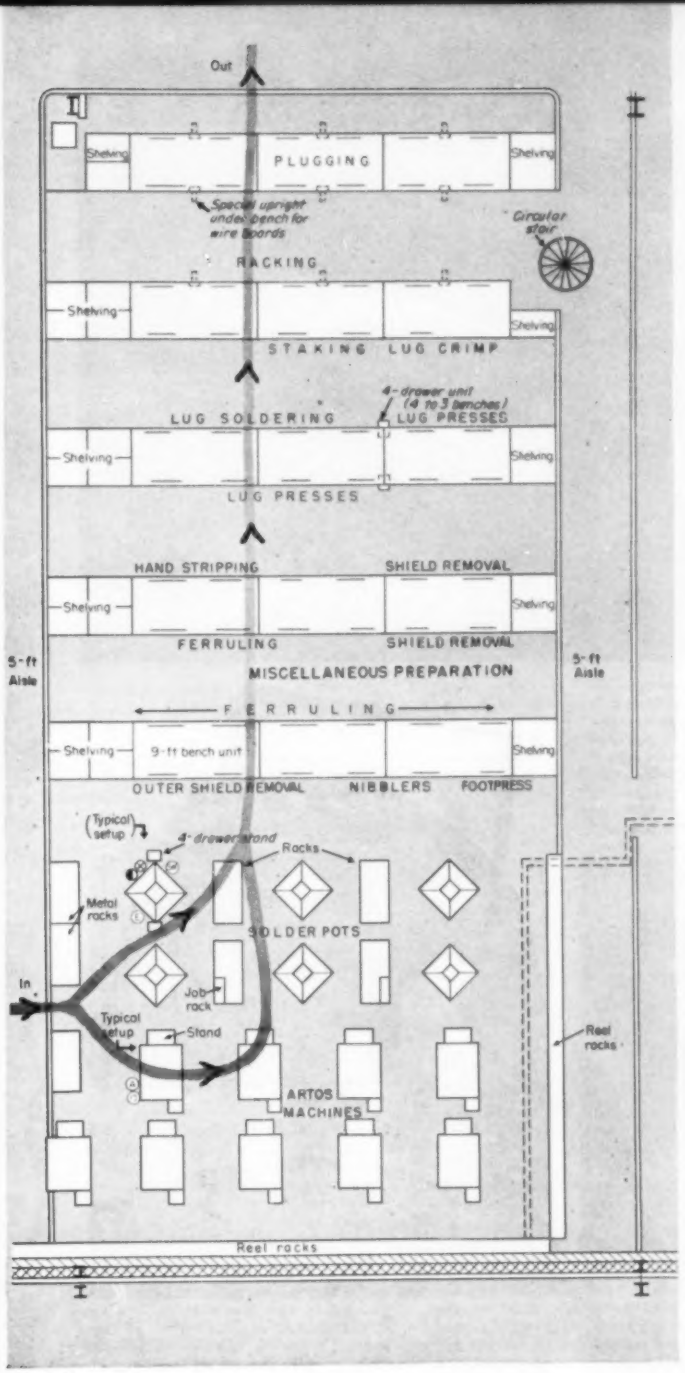


Flexible layout, on-the-spot planning, and coordinated flow



EFFICIENT LAYOUT... Key to the Sperry system is the letter-sized operation sheet (see title page), which describes one step of the job in plain language. Accompanying the operation sheet, where necessary, is an operation sketch sheet, illustrating the exact technique.

With these sheets, the over-all blueprints are not needed in the shop. The sheets carry more detailed information than a blueprint could, they include no complications, are compact and easily handled, are readily filed when a job is changed, can be subdivided easily to permit additional operators to be sandwiched in when production is increased, permit rapid job change to suit changes or emergencies.

The simplified floor plan on these two pages shows arrangement of the 80x100-ft wire-preparation and resistor-board departments, pictured on the next page. Jobs come in directly to either production-planning unit down the 5-ft cross aisles. Parts and materials likewise come in from the general stockroom across the 10-ft aisle at far left, or through the double doors at lower left to the drop areas. Flow thereafter is upward through the departments to the boards in the harness-assembly department, shown in similar floor plan on page 152. Steps in scheduling and processing are pictured on succeeding pages. Note location of foremen, assistant foremen, and timekeepers along the 5-ft internal aisle (the gutter between pages here). Storage areas for parts, jobs, and finished work are along all three vertical aisles.

Most work areas are equipped with standard 4x9-ft, linoleum-topped benches, and floors are also linoleum covered, for cleanliness and avoidance of abrasion or damage to wires or light-alloy parts. Benches are wood-edged and trestle-legged, with a continuous footrail underneath. Operators work along both edges, seated where practicable in adjustable posture chairs, with their tools in an individual locked drawer at their sides. Bench tops are clear, except for clamp-on type universal fixtures or assembly machines and tools currently being used. High-level fluorescent lighting is high overhead, so only inspectors' locations have close lighting. Power and air outlets are provided at each work position directly under the edge of the bench top.

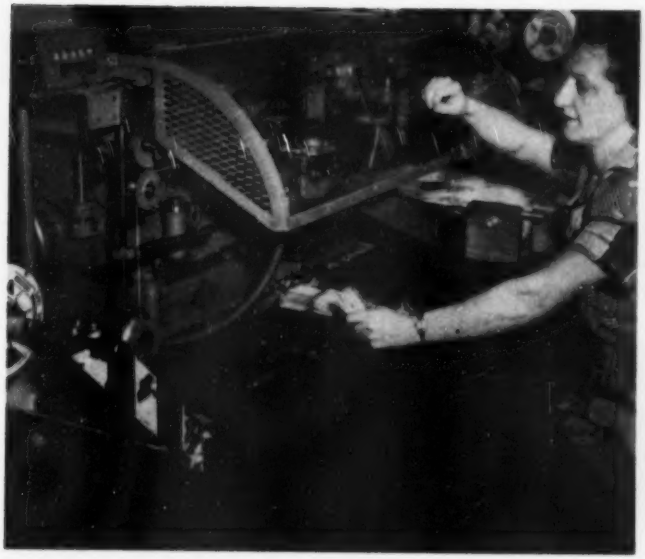
feature wire and resistor-board preparation

Flexibility and neatness are evident in this general view of part of the wire-preparation department, which is completely air-conditioned. At top right is the production-planning unit and the drop area, at top left the stock of reeled wire on three sides of the Artos machines, which cut it to length and remove insulation from wire ends. Just below these machines are the tinning pots, while the three benches in the foreground show ferruling and stripping stations, lugging and plugging. Special jobs and resistor boards are produced beyond the stock shelves at the right, which line the inside aisle of the department. Note marking of work stations

Tagging precedes any wire operation. Jobs go from production control to this bench, where a tag is written for each piece of wire in the job, whether the finished work is a harness, a plug, or a subassembly. Double-sided printed cards, 2¼x2½ in., go in a plastic pocket with an eyelet and string, so they can be attached readily and securely to cut wires. Note posted extract from operation sketch sheet, showing two types of ground wires

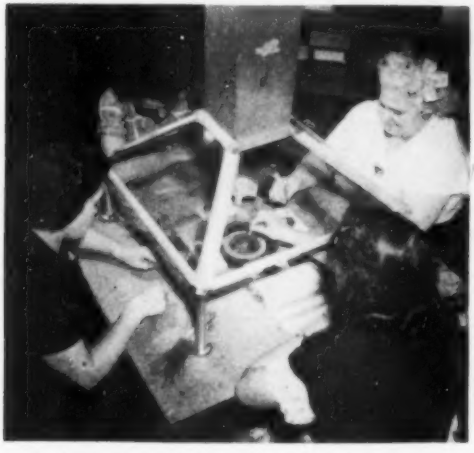
Key to production control is this tag, which replaces the usual operation sheet. On its face is the assembly number, number of the end product, the run number, and sequence in which wire part is assembled. Wire specification and over-all length are on the next line, then wire-gage or AN number and color. "Quantity Required" may be shown but is usually in grease pencil on the transparent tag shield. "Quan. Per Assy" shows how many times the same wire is used—a "2" here would mean cutting double the number of pieces under "Quan." The final two lines show terminals to which this wire is assembled. The opposite side of the tag has "From" and "To" columns, representing opposite ends of the wire. The first three lines show removal, in inches, of outer insulation, shielding, inner insulation. Type of ferrule sleeve, size of ferrule, ground length and type, lug sleeve and lug are shown in turn. On remaining lines are special processing instructions

Operation tags control



Artos-Machine operator receives tags arranged first in order of type and gage, then in order of length of insulation to be stripped. Once set for a given job, the machine, which cuts wire to length and strips insulation for required distance on each end, runs automatically. When counter at top left indicates required number of pieces have been cut, operator bundles and holds them with paper tape from reel at right and by looping string on tag over them. Next tag may require only one change

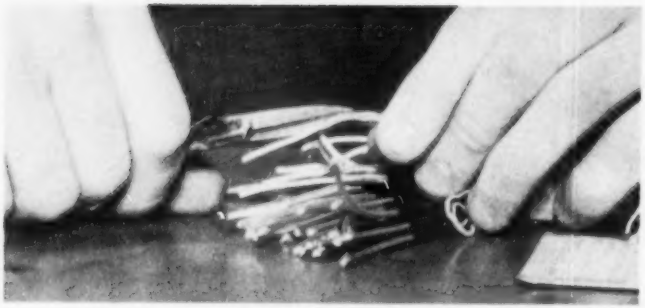
Wire too heavy for the automatic machines is cut on a small alligator shear powered by an electric solenoid under the bench. A Microswitch with target button is adjustable along a measuring bar. The operator draws wire from a spool on the horizontal turntable through the shear and out to the switch. When the wire end strikes the button, the shear cuts wire to length. Counter records shear strokes. Cut sections are assembled and held by paper tape and the tag



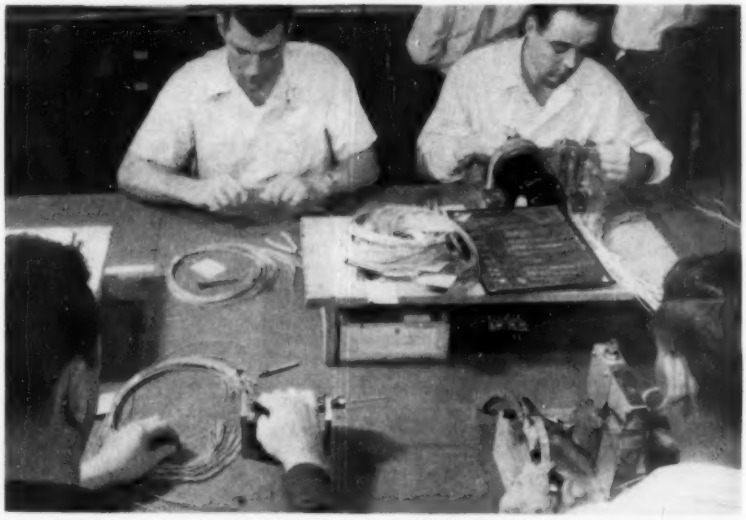
"Tin" stamped on the tag sends the bundle of wires to a tinning station like this one. Operators seated around a central pot, in which solder is kept molten electrically, twist stripped ends of several wires at a time, jostle them on a pad for alignment, then dip them in flux and the molten solder

Markers (identifying sleeves) for wires are made from "spaghetti" tubing fed from a reel through guides under a stamp and an ordinary typewriter ribbon. The section previously stamped is sheared off each cycle. Markers are placed in the tote box at back; the 200-watt infra-red lamp over it dries the ink in a few minutes

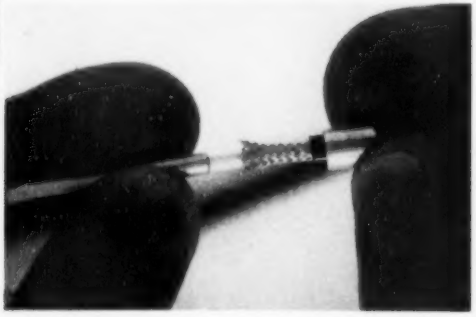
wire preparation



Shielded wire was formerly stripped by hand scissoring, as shown. Shielding was sometimes twisted about itself and soldered to make a ground lead, but more frequently was cut away, leaving frayed ends and the likelihood of damaged insullation



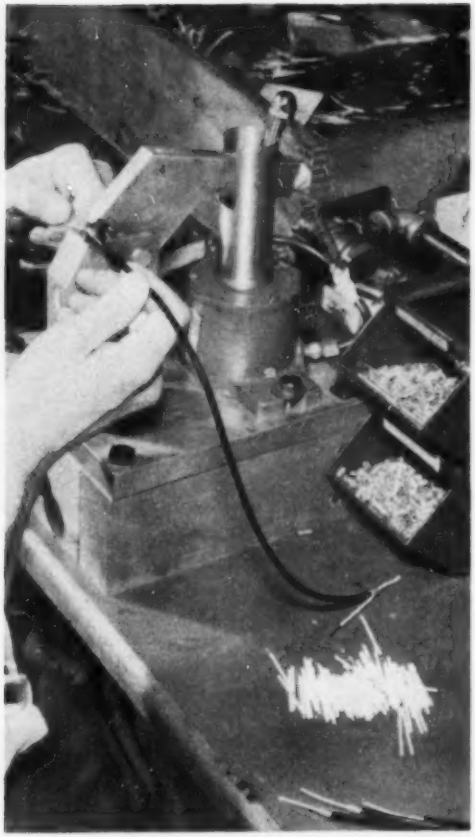
Two operations replaced the original shielding stripping. Operator at left top gripped the shielding between two collar-like tools slightly separated, then pushed the tools together, creating an annular hump in the woven wire. Then the operator at top right placed the wire in a homemade horizontal nibbler, which cut the hump away and allowed the end to be slid off



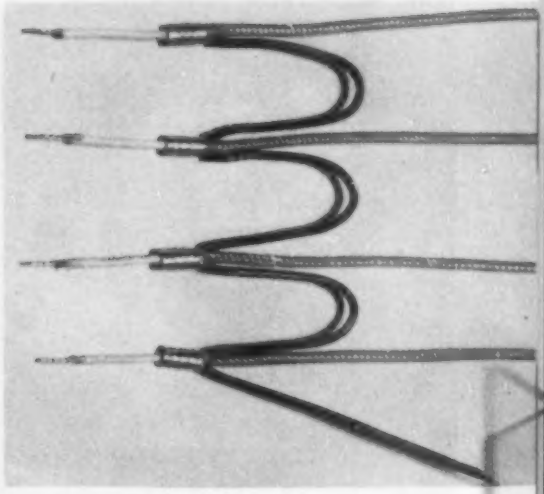
Clean trimming of shielding is important for the next operation, ferruling. Note that outer ferrule, at left, must be passed over shielding and on to outer insulation. Then the inner ferrule is pushed between shielding and inner insulation, the outer ferrule brought back to the end of the shielding, and the two crimped together

Ferruling is a 2-step operation. First the operator slides the outer ferrule over the shield and insulation, then she slips on an inner ferrule which is pushed between the shielding and the inner insulation. The outer ferrule is then pushed up to the outer end of the shielding, and the first operation, all done by hand, is complete. Actual crimping is done mechanically

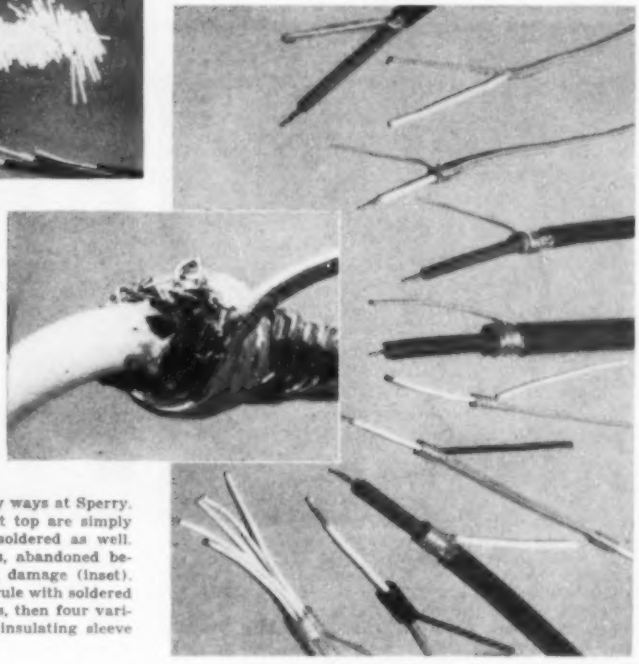
Woven shielding is no



When outer and inner ferrules are in place, the assembly is set in this pneumatic press and crimped. Multiple teeth on crimping dies form a series of annular rings in the softer outer ferrule. Screw at back adjusts crimping pressure. Ground leads are put in here, as shown on lower end of wire. Note small nesting boxes for ferrules. Such boxes are widely used for parts

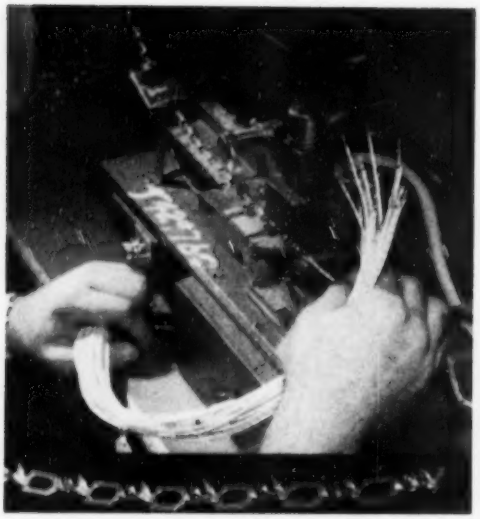


Complex bridles like this one show the advantages of ferruling. Joints are neat, compact, electrically excellent, and secure. A newer method of ferruling, still under development, will crimp the outer sleeve into a hex in one crimp; will supplant this one, which requires several crimps, if it can be made foolproof



Ground leads have been attached in many ways at Sperry. Here are a number of them. The two at top are simply twisted shielding, the outer one being soldered as well. Next are two wound and soldered leads, abandoned because of the frequency of soldering-iron damage (inset). On the heavy center cable is an early ferrule with soldered leads, next a crimped ferrule with eyelets, then four variations of the present method, one with insulating sleeve and another crimped over five wires

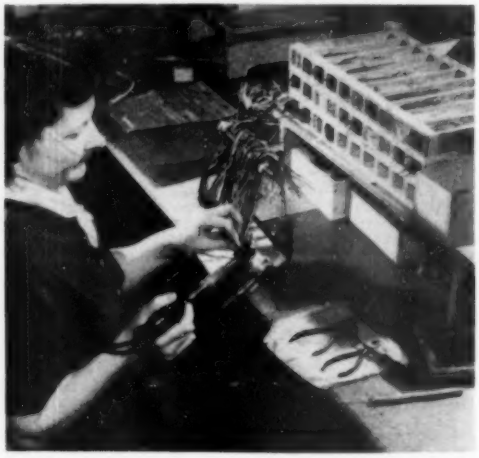
longer troublesome



Hand crimping and soldering of lugs is being supplanted by this automatic lugging machine. Solder-coated lugs are fed from a reel as a continuous chain (inset). They pass over a preheated plate to a hot die. The operator inserts a wire end and depresses a foot valve. This causes the pneumatic press to close the crimp fingers together, to shear the lug from the chain, and to bend its ends up. The die is hot enough so closing it momentarily will cause the solder to flow. Here the safety shield has been removed temporarily to obtain a clear picture

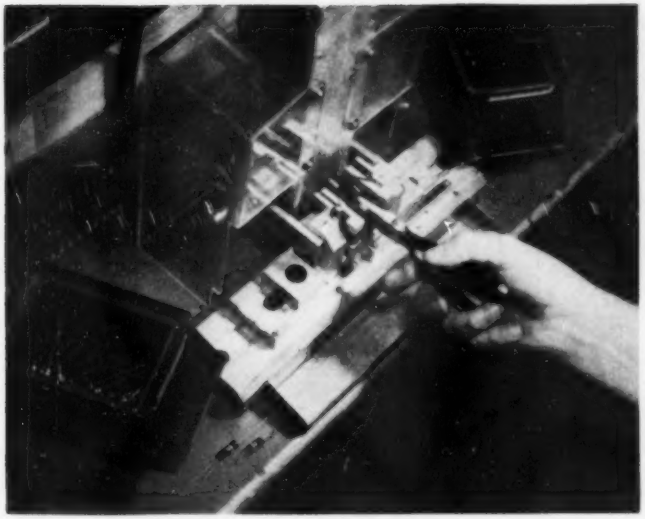
Racking ends preparation of most wires. Tags are removed from bundles and wires are placed in the proper numbered pigeonhole in these special plywood racks. At the bottom of each pigeonhole appears the number of the wire and the numbers of the terminals it connects. Bundles are inserted from left to right and from top to bottom in stacks of racks clipped together at the sides. One stack contains all the wires for a particular job, in the order in which they are used. Tags are returned to tagging station for filing and reuse when the job is run again

Plugs and connectors have hollow connection pins prefilled with solder. The assembler need only heat each pin in turn and insert wires. This picture also shows two arrangements of soldering-iron stands, that at top when the operator handles the iron, that at bottom when he wants both hands free to handle assembly elements. The pad on the foot of each stand is for wiping the iron tip



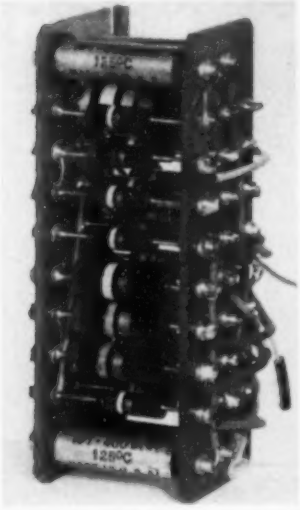
Standard fixtures handle a variety of plugs, in any convenient number. The coil spring along the top of the fixture holds wire ends out of the operator's way. Operator simply takes proper wires from rack on bench and solders them in accordance with sketch sheet at her left. All plugs are presoldered before wiring, and all wiring is done before the plug is laid into the harness

Lugging and plugging complete wire preparation



Leads of all small capacitors and resistors are preformed and cut to length simultaneously in this horizontal-acting pneumatic press. A resistor before leads are preformed, and one after, are shown at lower left. Dies are adjustable for span and shape of leads

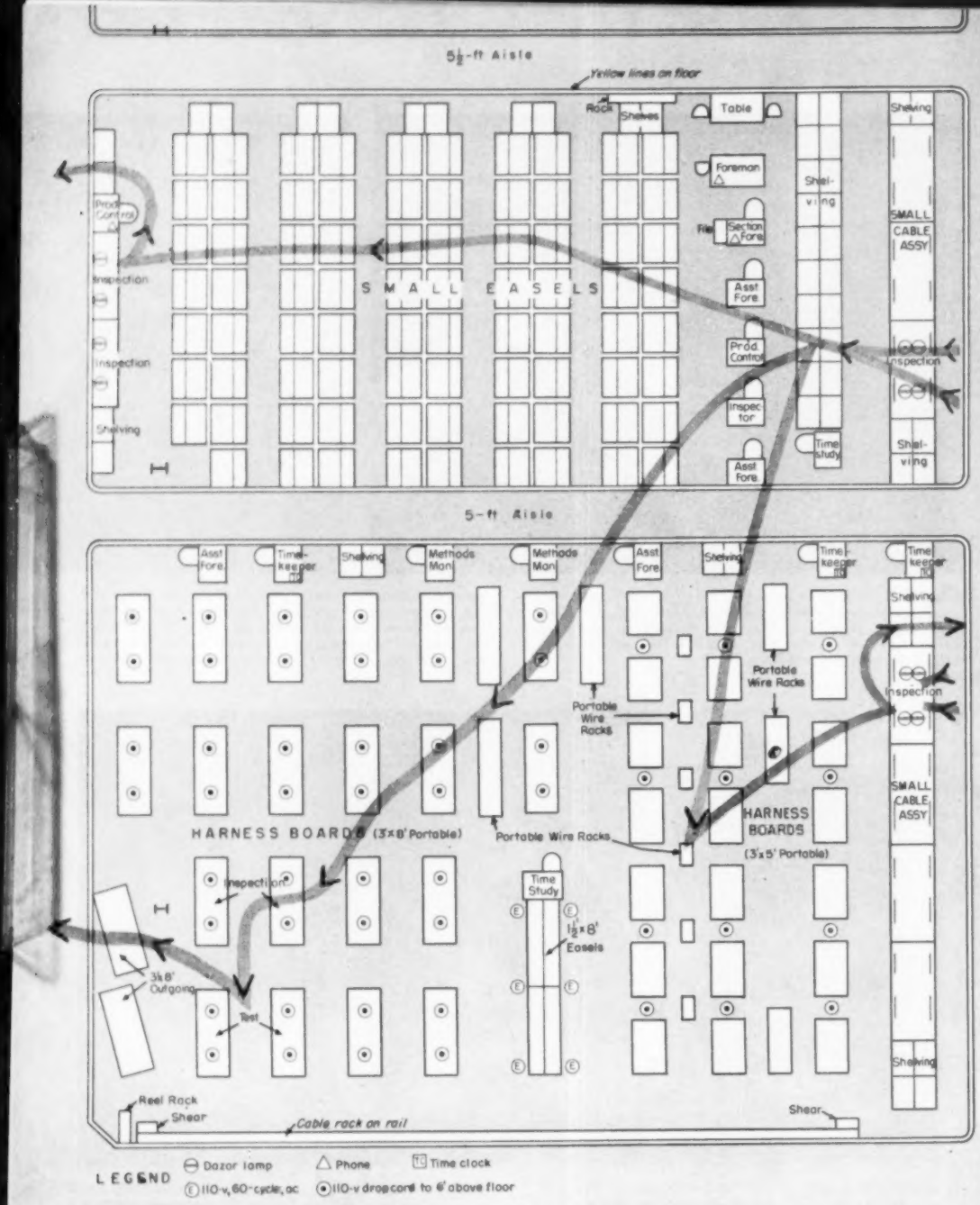
Preformed leads are hooked around terminals and wiped with a hand tool consisting of a sleeve at the end of a knurled handle containing a sprung leaf with half-round end. This leaf is snapped over the lead and the lead wiped into a flat ring. Soldering is done by another operator



Sandwich assemblies of resistors and capacitors have been designed to save space. Component leads are simply pushed through eyelets in terminal holes, soldered, and clipped. Jumpers and leads may be added in the same operation. Such a sandwich may include 30 resistors in a sixth or less of the previous space

Small assemblies with many electrical parts are held in universal multiple fixtures. The operator picks parts from stack bins arranged in order of use, crimps and solders them into the assembly as shown on simplified operation sheet and sketch. A typical sketch sheet is at right

Resistor and capacitor assembly is exact, too ⇨⇨ ⇨⇨⇨



An 80x100-ft area is likewise utilized for assembly of cables and harness, with equipment varied to suit size. Incoming parts (bottom) are inspected, then flow upward to completion and final inspection

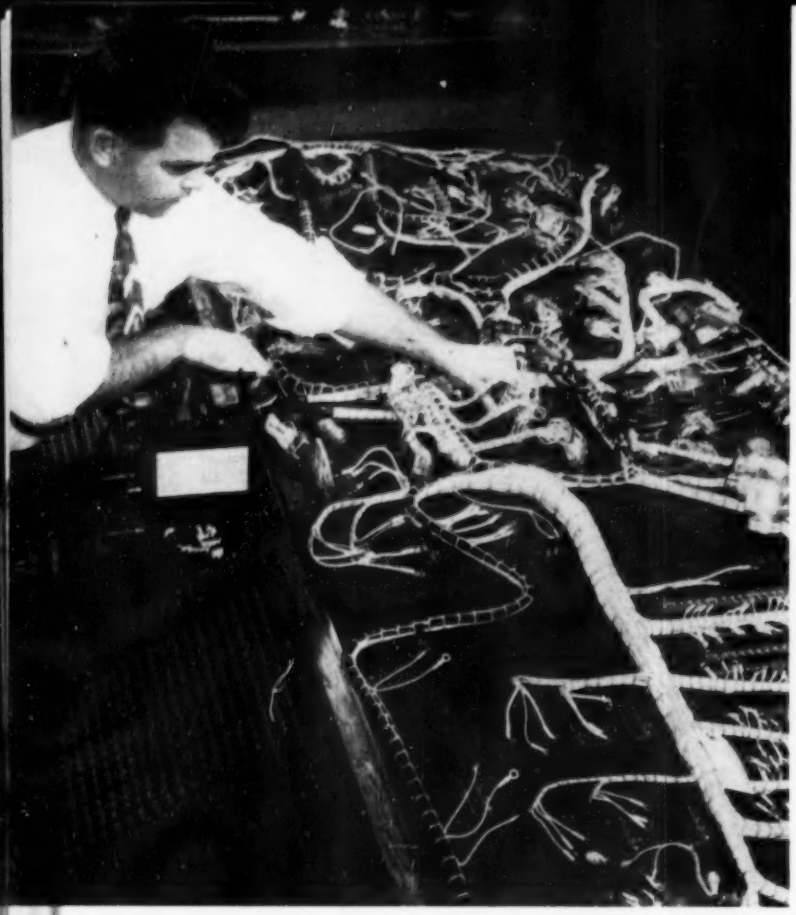
Assembly of cables and harnesses is

Part of the cable and harness department, seen from lower right of the floor plan on the facing page. Wire racks loaded for jobs, foremen's and production-control stations are in the foreground, easels for small harness boards in central background. The inspection bench is at far back, and horizontal boards for larger harnesses at upper left

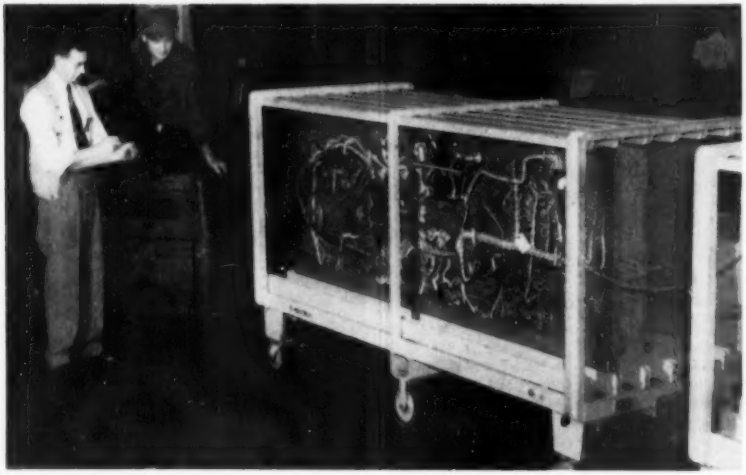
Easels for small harness boards permit operators to work seated. Slope of tilt top is adjustable by a holed board set over dowels at back. Space under the top permits storage of tools and personal effects—is in effect a lockable personal locker. Racks containing all wires for the harness stand on a low table beside the operator

Three-dimensional harnesses are similarly produced, so wires will occupy available space. Here the harness board is a box faced with prints (really the operation sketch sheets) of the finished harness and having "dugouts" or receptacles for plugs, connectors, etc. Terminal points are cotter keys driven into holes; wire ends are caught in the key slots and carried around and between other cotter keys as the print shows. Each key is numbered, and racks carry terminal numbers

mechanized also ⇨ ⇨ ⇨ ⇨ ⇨ ⇨ ⇨ ⇨ ⇨ ⇨

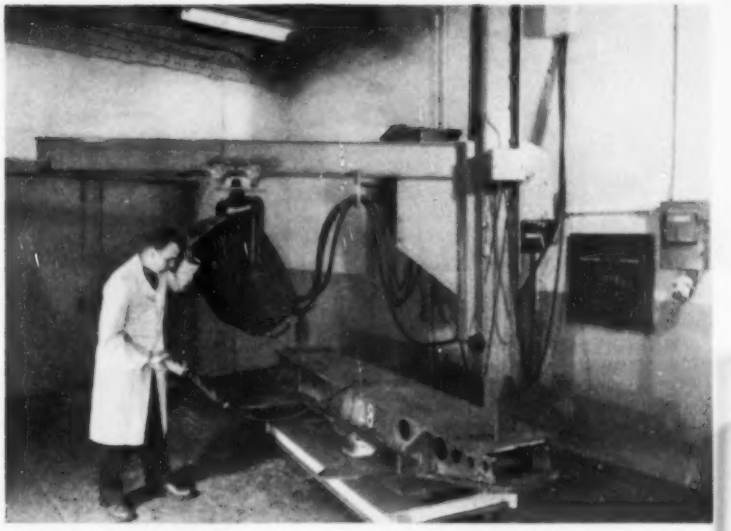


Large harnesses (some contain 600 wires) are made on horizontal boards so two to four operators can work on them simultaneously. If several boards are arranged in a line, a group of operators can work each harness in rotation, using progressive assembly technique, each operator laying in approximately 50 wires from a wheeled rack he moves with him. Finished harnesses are bound, then moved to this large test fixture for "buzzing out." Note test buttons and lights at lower left. This harness, containing more than 600 wires, is so bulky that a special tote board is required



Special tote boards carrying large harnesses are placed in special trucks which carry six boards, then towed to final assembly. Swinging gates over support posts hold parts in proper position on each board. A chain across the truck end prevents sliding of boards during transport

Big harnesses require special handling •



Typical industrial X-ray lab has tube unit mounted on electric jib crane. Special low truck support weldments or castings on swivel

X-Ray Perfect

When you're worried about quality control and think of X-ray only in terms of owning and operating your own equipment, you're passing up a good bet. There are numerous commercial X-ray laboratories in the country, and many plant X-ray departments will take on outside work if their own time is not jammed up

BY DAVID GOODMAN

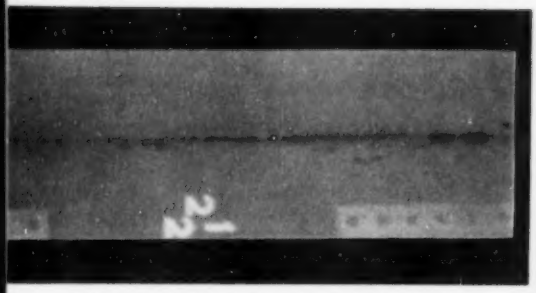
ONE point X-ray men make about their work is that it isn't just inspection for flaws; it is foundry control or quality control of raw materials received. Sometimes it is even more.

For example, there are four commercial X-ray laboratories in Chicago. One, the Pennies Industrial X-ray Co., was started during the war to produce penetrometers, which are instruments that indicate radiographic sensitivity. Gradually the company expanded into X-ray inspection, and it now has three units working for customers on contract or on a job-lot basis.

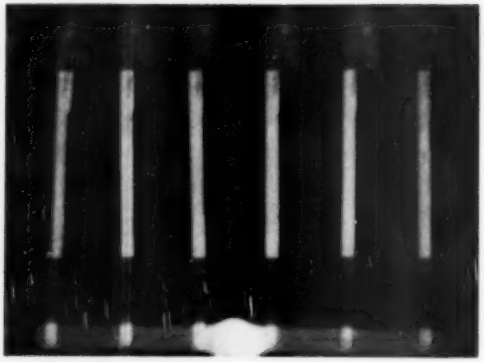
Castings are supplied to Pennies by a given company. Usually the customer is a metal-working outfit that has no X-ray department of its own, and wants 100% or spot non-destructive inspection of castings or weldments supplied to it by another shop.

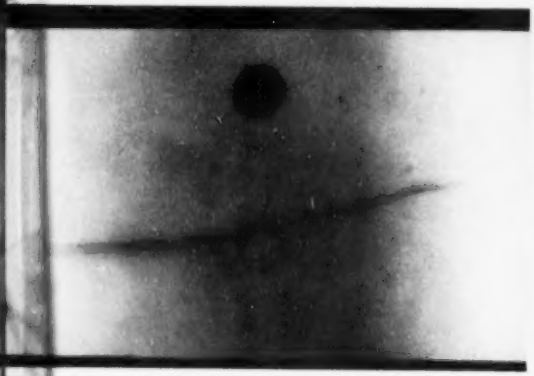
Pennies take exposures, interprets the film for the customer, recommends acceptance or rejection of the material, and may suggest ways in which the defects, if any, can be overcome. This last service, which may include recommended changes in product design, foundry practice, or fabricating procedure, is one that provides technological advice for a company that may have no other way of getting it at reasonable cost.

Pennies points out that the customer often gets protection against risk on a new product, because radiographs taken before production actually starts may show up design or production weaknesses that might not otherwise be noticed until too late to make changes.

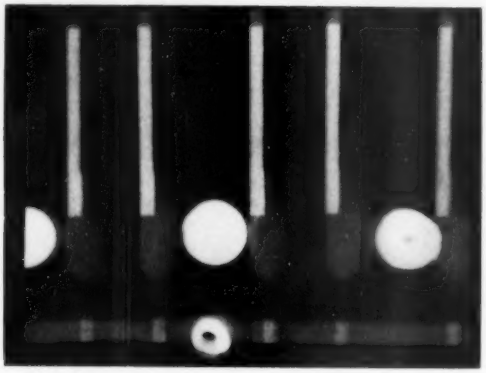


Radiograph of 2½-in. steel plates welded together clearly shows lack of fusion, slag inclusions, and slight porosity, none of which are visible without X-ray





Radiograph of simple steel casting illustrates unfused chaplet, crack, and gas pocket



First radiograph of multiple castings (top) showed up serious shrinkages. **Second radiograph** (bottom) taken after new pouring technique was tried, proved change was effective

But the basic idea behind X-ray inspection is checking to insure the quality of purchased materials. X-ray costs these days are low enough to make savings when there is doubt of material quality.

One foundry, for example, had its own output checked to insure quality (and, incidentally, its good relations with its aircraft-manufacturer customer). As it turned out, 33 of 44 castings were defective. At a cost of $7.50 per unit, the foundry saved a machining cost of $225 per unit, which is good economics in any language. The foundry spent the money for inspection, but saved its relations with the other manufacturer, which would have taken a bad turn had the 33 bad castings gone through.

In a similar case, if work was done for the armed forces, it might have cost the foundry not only the customer, but might have cost the foundry all future possible contracts.

Pennies has worked the other way, too. When a producer came to the lab because a purchaser refused to accept defective parts, Pennies successfully defended the producer on the grounds that these particular defects were inevitable in the alloy metal specified by the purchaser. Having no axe to grind, the independent laboratory was in a position to be impartial and to suggest that either a different alloy or a different product design be adopted.

Techniques

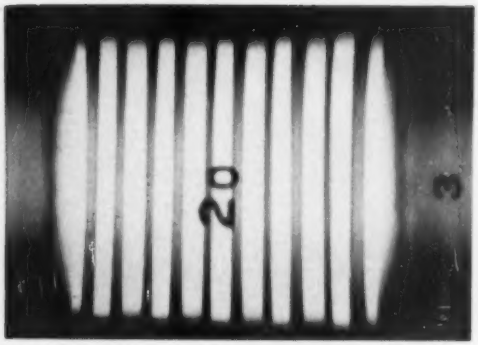
Many batches are checked 100%, especially if the order is for military service or the product is critical in an assembly. But in many cases, the commercial laboratory can do complete inspection on the first one or two pilot batches of parts, then make regular spot checks on the production run.

Claud S. Gordon Co., another of the Chicago laboratories, started up in 1929, so it is a pioneer in the business. Gordon produces protecting tubes for pyrometers, and utilizes X-ray to guide its welders in maintaining good practice. The company has found the claim, "X-ray perfect," commands premium price, too.

Charging strictly on a time-and-material basis, Gordon checks anything from hams to golf balls. In one case, the lab inspected two competitive coffee-jar covers, concentrating on the rubber gasket. The results decided a patent-infringement law case.

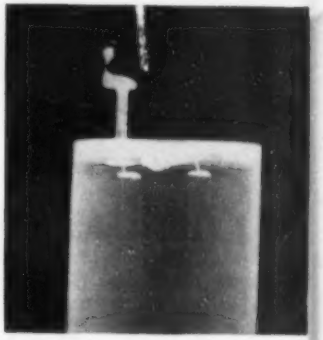
Gordon has found that manufacturers tend to X-

Automotive crankshaft contains shrinkage in hub at right



Flexible joint for metal tubing is perfect, proved by X-ray

Semi-automatic GE radiograph machine with automatic film developer (one shot a minute) inspects 2000 castings for each Fairchild C-119 *Flying Boxcar*. Lead-lined doors close automatically after tray of parts is located



Radiograph of electric capacitor taken to see if lead wires were continuous. They were

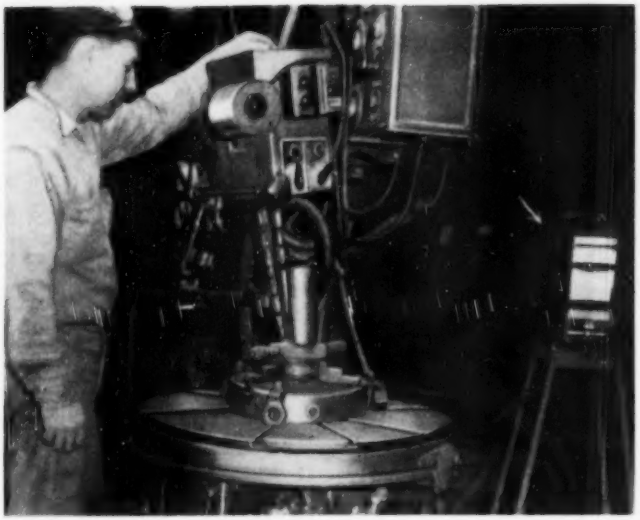
ray only after a complete assembly has been made; which is often a mistake. First, inspection after assembly does nothing for errors or defects except detect them too late. Second, it may force an expensive mechanism back to the shop for many hours of extra work when only one small part is defective. Checking during production, or after individual parts are made, is more sensible. In addition, X-ray inspection of all parts in a given machine may be waste of time . . . for only a few may require inspection of internal structure and of these, some may require 100% inspection and others need only spot checking.

Although Gordon is a commercial laboratory, it is also a production organization and utilizes X-ray inspection much more than any of its customers do. Even inspecting its own purchased raw materials, Gordon finds, saves costs. Although many plants could not justify this extensive use of such inspection, it illustrates the fact that X-ray can be applied much more widely and effectively than it is now.

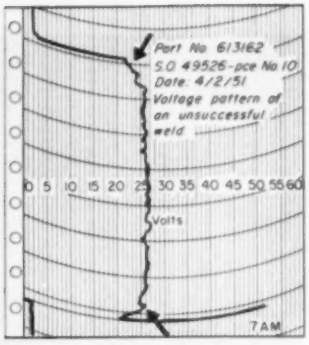
Two other Chicago companies, Thomas B. McGuire, and Superior Industrial X-Ray Co., do similar work. A manufacturing plant can determine the value of X-ray inspection to itself on this basis: First, a test batch of sample parts can be inspected by the commercial lab. Next, the cost saving brought about by rejection of defective materials, compared with the cost of the inspection, can be figured. If a batch of reasonable size is picked, and the results can be considered representative of all the materials concerned, the answer is pure economics.

Being by nature small plants, not all X-ray labs would have the necessary production know-how to recommend design and production changes to eliminate defects in a given product; but such a lab would at least be able to interpret the films. A conference between a design man, a production man, and an X-ray technician should result in a reasonable approach to eliminating the defects. On this basis, inspection is worth a good deal more than the value of just the few defective parts that are caught.

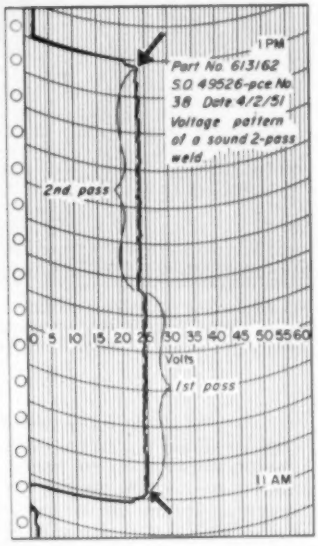
Defective parts, if not caught, may skim off the manufacturer's profit, which would eliminate his reason for being in business. Therefore, the commercial laboratory is a definite possibility in a production setup where hidden flaws mean the difference between dividend and red ink on the books.



Recording voltmeter installed alongside an automatic, submerged-arc welder permits operator to check voltage pattern and judge condition of the weld



Voltage pattern of an unsuccessful weld caused by lack of root penetration. Result was a one-pass weld instead of two—the bottom of the groove being filled with flux


1 PM
Part No. 613/62
S.O 49526-pce No 38 Date 4/2/51
Voltage pattern of a sound 2-pass weld
2nd pass
0 5 10 15 20 25 30 35 40 45 50 55 60
Volts
1st pass
11 AM

Top-quality, two-pass weld exhibits an almost straight-line pattern, which is an indication that the weld will pass X-ray inspection

RECORDING VOLTMETER CHECKS WELD QUALITY

By GEORGE A. HATFIELD, Production Superintendent

The National Supply Co., Torrance, Calif.

ON some of the wash pipes we manufacture, we weld a machined steel ring at one end of the tubular body to form a shoulder. Welding is done on an automatic submerged-arc machine, so the arc and bead are hidden from the operator during application. Thus, he cannot check the work or make adjustments for erratic behavior while the weld is being made. To be on the safe side, we had been in the habit of laying two beads, one over the other, to get a high-quality, leakproof joint.

Even with this practice we had no definite assurance of a quality weld, or any indication that the machine was operating erratically until the part was tested and inspected. What we needed was some means of indication that we could interpret in terms of either harmful or merely incidental departures from normal.

After investigating several methods, a joint committee from the weld shop and electrical department selected the idea of measuring the voltage variation across the arc as the best telltale of conditions in the weld. Connected across the electrode and work, a strip-chart recording voltmeter has provided true pictures of the welds that match X-ray tests.

To correlate the pattern on the chart with the welded part, both the part and its chart pattern are numbered, and if the chart curve deviates from normal, the part is forwarded to the laboratory for X-ray. To reduce X-ray examinations to those parts exhibiting flaws that might cause leakage, we are building up an album of records by attaching the voltmeter chart to its corresponding X-ray film together with a statement of facts bearing on the case.

As the album library grows, we will be able to identify variations on the voltmeter chart with the type of operating incident and its effect on the product, to minimize the number of X-rays needed.

Shop Pensioners Disprove the

First survey of pensioned shopmen shows all popularly accepted theories are wrong. What should the employer do? How do habits change? Is a hobby important? Does TV help? HERE are answers from personal interviews with 500 retired Clevelanders.

WHO THE PENSIONERS ARE:

483 men retired (85% automatically) 1946-1950 from six companies with pension plans at least 10 years old. Included were Warner & Swasey, Cleveland Twist Drill, and G E Lamp Division. Average age 68. No top executives. 61% foreign born, some still requiring interpreters. Of the 515 total, 6% could not be located, were too ill, or refused to be interviewed. The 94% required as many as 6 call-backs because of absences, but pensioners wanted to help, enjoyed a visitor, and were flattered. Surveyed by Special Surveys, Guildhall Bldg., Cleveland, in the Cleveland area, all by personal visits.

the happily adjusted pensioner...

1. is married and living with his wife
2. has no children
3. owns his own home
4. has some savings
5. was not too enthusiastic about his last job
6. retired for normal reasons

the unhappy pensioner...

1. lives alone in rented quarters
2. is the father of one child
3. has never saved anything
4. liked his last job
5. retired because of illness

these factors affect retirement...

Occupational level

Age

Interest in religion or politics

Self-planned retirement

Living within retirement income

these do not...

Hobbies

Birthplace

Television

Planning for retirement

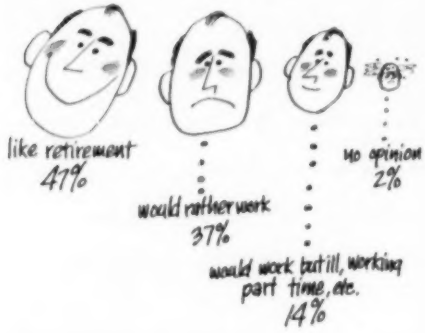
Time for adjustment

American Machinist SPECIAL REPORT NO. 306 TO THE METALWORKING INDUSTRIES

Copyright 1952 by McGraw-Hill Publishing Co., 330 W. 42nd St., N. Y. 36, N. Y.

Rules ... every one thinks he

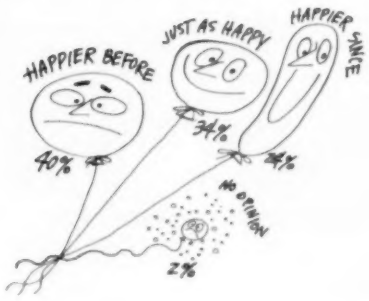
their attitude ...



financial status ...

retirement was easy...

happier before retirement...



from these results, pensioners were subdivided into 3 classes..

			OF PENSIONERS IN THEIR GROUP:		
			OWN HOMES	OWN TV	RADIO ONLY
positive	(adjusted)	36%	42%	38%	35%
negative	(not adjusted)	17%	16%	17%	17%
intermediate	(not consistent)	47%	42%	45%	48%

American Machinist, April 14, 1952 Pages 159-161

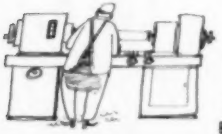
e's the exception

BY R. E. COCHRAN, CLEVELAND NEWS EDITOR

when should a worker retire ?

vary with individual..44%
retire at 65.....24%
retire before 65.....19%
retire after 65..... 9%
no opinion..... 4%

they'd rather work ...



	Retired Before 65	Retired at 65	Retired After 65
wish he'd worked longer	36%	48%	48%
wish he'd retired sooner	12%	8%	7%
satisfied	38%	36%	37%
qualified answer	14%	8%	8%

Best work years are the decade from 21 to 30, say 39% of the pensioners, with 29% saying it's the decade from 31 to 40. Unskilled laborers claim their twenties as best, but white-collar workers preferred later decades, 28% preferring their fifties. Most agreed that their best years were over at 60.

money is the greatest problem ...but isn't a greater worry now

NO PROBLEMS 37%
MONEY 24%
ILLNESS 11%

how does retirement affect health?

	ALL	POSITIVE	INTERMEDIATE	NEGATIVE
same as when working	45%	40%	46%	14%
healthier now	21%	61%	34%	5%
healthier when working	35%	17%	53%	30%

NOTE 1 . . Of men retired because of illness, one-fourth have become adjusted, but the majority claim better health before retirement – allowing no margin for advancing age or working strain

NOTE 2 . . During the 6-week survey, three pensioners died – an annual rate of 52/1000, exactly that for Age 68 in the American Experience Table. This and attitudes of pensioners nullify the belief that retirement leads to early death

NOTE 3 . . More than a third of the men have some apparent defect or chronic impairment (arthritis, asthma, heart condition) which has affected adjustment

what's bad about retirement ?

Shop Pensioners Disprove the Rules...

retirement is a losing business..

can save some	**8%**
spend more than pension & Social Security	**59%**

Only a few men receive greater income (including Social Security) than their former take-home pay; many were hired after 50, so don't get full pensions (a few get less than $10/mo.). This might change answers for later groups

some individual opinions...

A machinist: "I can sleep in the morning now, when other fellows have to roll out and go to work. I used to like to work, but now I'm lazy and I enjoy doing nothing."

Another: "Working is like reading a book; every day you turn to a new page and there is something different. But being on a pension is like opening to two blank pages."

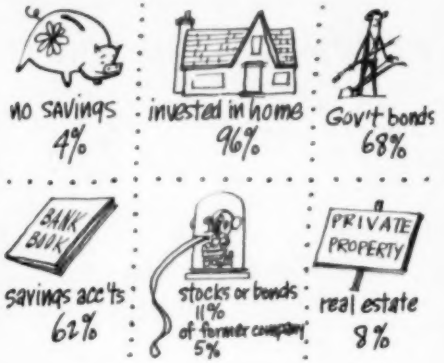
A personnel man: "I moved from a man's world into a woman's world. I shop, help with the housework, and listen to my wife gossip with her friends over the telephone."

Often heard: "Hospitalization insurance cost so much when I had to shift from company group rates to individual ones. I had to drop it when I needed it most." (Some men used all their savings to pay doctor and hospital costs.)

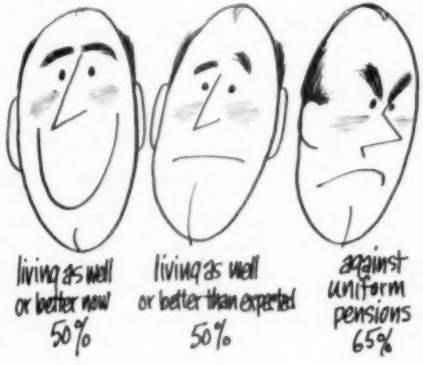
"social security makes liars of us"

Hale and hearty pensioners condemn Social Security restrictions, which prohibit payments to retired men who work. The survey showed a sizeable number of men work full time (as many as six callbacks had to be made in many cases), but conceal the fact. One in seven of the 59% who said they spend more than income admitted working. 22% say they make up their overspending from savings; others make it up from rental money, investment income, get help from children or friends; 3% have working wives.

savings at retirement...



living is no worse...



who should pay for retirement?

relations with relations...

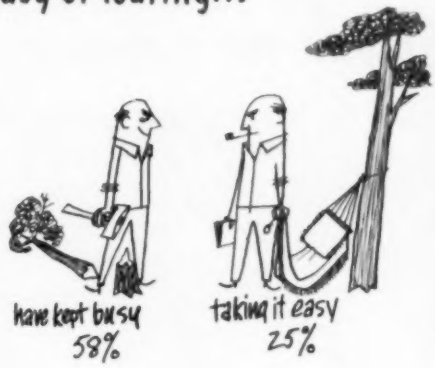
Three-quarters of the pensioners live with their wives, two-fifths share the dwelling with children. Men living alone are least well adjusted to retirement, but 28% of the men not living alone feel the family would rather have them at work, as compared with 54% who believe their wives prefer their retirement. In most cases, retirement has brought husband and wife closer together – but sometimes the result is doubled dissatisfaction because both want to work or "he is under foot." About half the men had three or more children, but men with no children are better adjusted to retirement than those with families, particularly families with one child. Of the "positive" group, 43% were childless, 25% had one child, 37% had two or more children.

what's good about retirement?

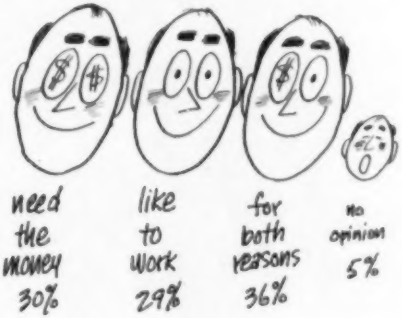
1. . feeling of independence (18%)
2. . doing things now that he wants to do
3. . no alarm clock
4. . can take it easy
5. . no worry, and no pressure
6. . vacation from work
7. . security with enough income

. . . BUT 23% like NOTHING about it

busy or loafing...



retired men still work because..



how they keep occupied...

work on house or garden	64%
hobbies	4%
part-time jobs	16%
full-time jobs	10%
reading, radio, TV	11%
traveling, riding around	13%
watching sports	8%
loafing, walking	19%

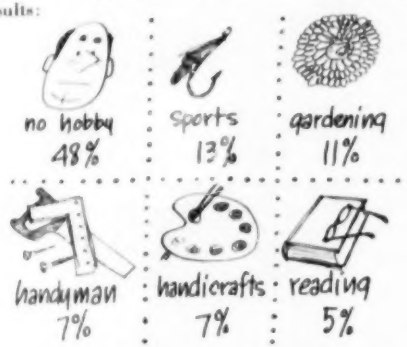
Traveling is most often associated with adjustment (56% in positive group), full-time jobs with non-adjustment (31% in negative group, only 17% in positive), more than loafing or sedentary activities. 40% of the positive group have part-time jobs, however, only 13% of the negative.

leisure activities are the same whether or not a man is "adjusted"...

54% have TV; 17 of 20 who do call TV a major *evening* pastime (Not one pensioner mentioned TV as a reason for retirement). Other evening occupations, in order: Reading, radio, visiting, cards, movies, lodges and clubs, hobbies, sports, baby sitting. Only 2% admitted the neighborhood bar as an evening occupation.

hobby is a sissy word...

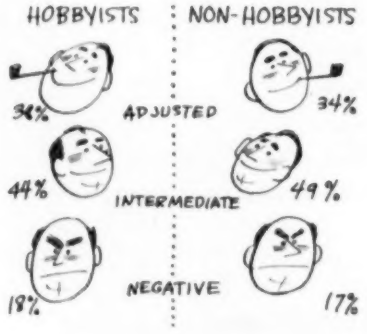
Hobbies, as such, were frowned upon as rich-men's playthings by some of the group. Most pensioners consider their own spare-time occupation is *not* a hobby, but those of their neighbors are. Some considered gardening a hobby; others did not; and there were similar disagreements on spectator sports, card playing, TV viewing. Finally, interviewers enlarged the questions to "hobbies or special things you like to do." The results:



Also mentioned: traveling, photography, painting, music, gun and lock repairing, and club work. About a fourth of the whole group have taken more interest in politics and religion since retirement; only 6% have grown more interested in clubs or organizations.

Unless a man has a hobby by the time he is 50, chances are that he'll never have one. Even if he does, retirement may sour him on it. Also he may take up a hobby he doesn't like — because pensioners are supposed to.

hobbies aren't important to adjustment



they'd do it over the same way...

Three-fifths of the retired men are interested in keeping in touch with former co-workers; many deeply appreciate company picnics, parties, and dinners to which they're invited. Some would like to go back to visit more often, but fear they'd be in the way. They eagerly recall company functions in large hotels — especially where they are singled out for achievement. Some of this feeling is nostalgia, appreciation of pension, or final impressions — but — *98% liked working for their companies.* Nine out of ten would go back to work for the same company if starting again, 57% would prefer it to working for the government, a small company or in trade. Here's why they liked their company, in order: treatment of workers, type of work, fellow workers, good bosses and he-man officials, security, soundly financed employer, good pay and bonuses, good working conditions, "just like home — I got used to it", employee benefits, only place worked, chance to get ahead.

But many men cursed some former bosses.

planning for retirement...

Planning started at least a year before retirement, *and carried out,* helps adjustment only slightly, but those who made plans, *and didn't follow them,* are worse off than those who made no plans at all. No help or advice on retirement plans was given by the company to four men out of five, and 52% of the pensioners are opposed to such an idea. It's obvious there's no pat formula for company counseling; the negative reactions might readily outweigh positive benefits.

Only 45% of the men could suggest things to be included in a counseling program — and half of those are not actually advice (i.e., the 14% who suggested bigger pensions). Suggestions for company counseling included: advising savings (4%), easier work to taper off, suggesting and explaining hobbies, notification and amount of pension well in advance, advising purchase of a home well ahead — and letting the pensioner keep on working in a lighter job.

how to be happy though retired...

Whether or not a man is busy bears no relationship to adjustment to retirement. But happy pensioners suggest these reasons (in order): own attitude, healthy and feel good, no reason to be unhappy, no worry or responsibility, good home with wife and family, keep busy and active, independent, sufficient income, etc. The unhappy pensioners give these reasons: own illness, small income, rather work, death in the family, nothing to do, lonely, illness in the family.

ROUND TABLE

PLAY BALL

"The boys seem to be rushing the baseball season this year, Ed. I understand they're passing a petition around. They want the day off to go to the opening game."

"That's perfectly natural, being as it is the national game. I don't blame the fellows one bit for wanting the day off, Al. In fact, I'll put my name to the thing if it ever gets around to me. I'd like to see the game myself."

"I thought you were grown up, Ed! Now you want to go to the ball game with the rest of the boys!"

"Sure I do! And if you were honest with yourself, you'd want to be in the bleachers with the rest, too."

"No, Ed, I've outgrown such things; I think there's a time and place for everything. I think the shop comes first—particularly now—and baseball can wait."

"Boy, we're bucking horns right now; I can see that. If there was ever one thing that the worker needs it is a chance to blow off steam once in a while. And this is one of the most thrilling contests ever put before man. Oh boy, the opener—the first game of the season!"

"But, Ed, it breaks up the organization. This thing of shutting down for anything that comes along isn't good for the business. First thing you know, we'll have to shut down for the first day of fishing season and the opening of the hunting season, too."

"The health of the business is measured by the spirit of the employees in that business. You can bet your bottom dollar that, if the fellows don't get them to shut down for the day, 50% of them will take the day off anyhow. Then what?"

"Well, there's that possibility; but I still feel that to give in to them is wrong. We're running a business, not a kindergarten."

"And I'll ask you to run this shop for me if they don't shut down for the game—'cause I'm goin'!"

"Ed, they've got to learn to play ball, too—with the boss. And running to watch somebody else play ball—even if they're good—isn't playing ball on the job."

***IS A DAY OFF** for the opening ball game, or some other purpose, appreciated; or does it set a precedent? Are we moving toward too many holidays? Does this cost production — or step it up? Your ideas and opinions will interest others. Discussions of earlier topics appear on later pages.*

HOW WING SKINS FOR B-47 STRATOJETS ARE TAPER-MILLED

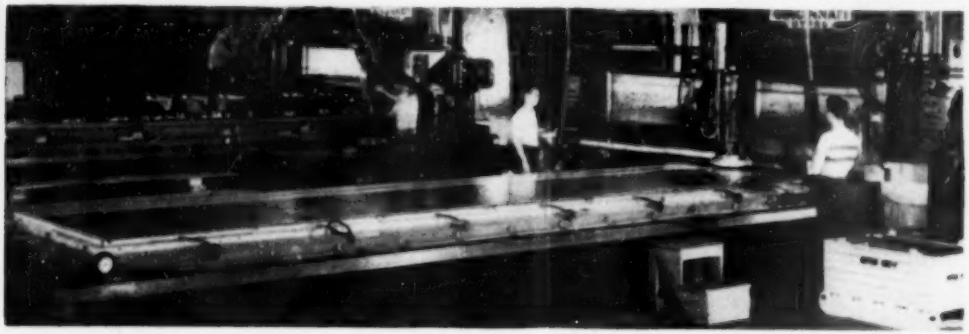
A summary of three years of experience in the Wichita plant, illustrating special equipment developed there

BY JERRY SANFORD, Chief Industrial Engineer, Wichita Division, BOEING AIRPLANE COMPANY

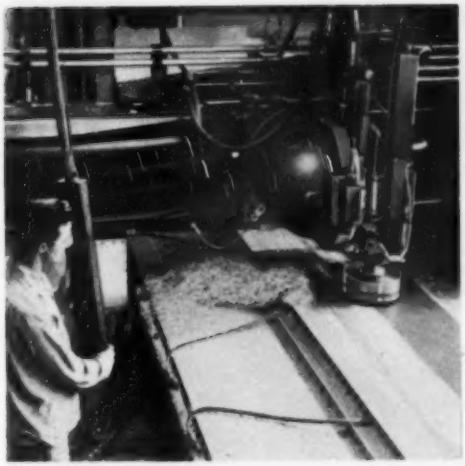
Many new production methods are employed in the manufacture of high-strength sparless wings at Boeing's huge plant in Wichita where the B-47 *Stratojet* bomber is produced. As forces in flight play heaviest on the fuselage end, or root, of a wing, the tip need not be as strong as the root. Therefore, in their search for stronger, lighter warplane components, Boeing engineers designed the B-47 wings with upper and lower skin panels which taper from ⅝-in. at the root to 3/16-in. at the tip.

Each of the two wings for the B-47 bomber support three jet engines and consists of 17 skin panels, not including leading- and trailing-edge fairings. These panels are bolted to transverse forged aluminum-alloy separators; some 15,000 bolts being used in the two wing assemblies for a *Stratojet*.

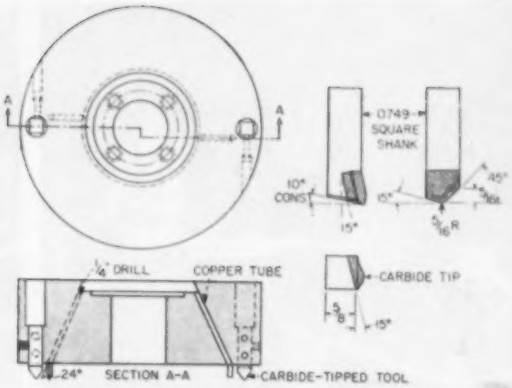
Six of the skin panels in each of the two wings are tapered, three in the upper surface and three in the lower surface. The largest tapered skin panel is machined from 0.320 in.-



Special 86-ton Cincinnati Hypro precision planer-type millers taper skin panel surfaces and shape the panels to close tolerances. Skin panels to be taper milled must be free from buckle areas and bent corners, must be thick enough to allow milling both surfaces, and must be cleaned thoroughly. Vacuum chucks and tapered shims "stacked" to within 0.002 in. at check point hold panels for taper milling on machine in foreground



Stratojet wing panels to be taper milled are held on 9 x 34-ft table of planer-type miller by means of vacuum chucks which leave entire top surface of panel clear for passage of face-milling cutter. Chucks are made up of square and rectangular cast-aluminum heads to suit size of panels. Each head has a synthetic rubber seal (Spongex No. RN-10) around outside edges and has cross-hatched grooves to maintain full vacuum, (27 in. Hg) over entire area. No distortion of the panels is experienced with these chucks. A rough and a finish cut are taken on one surface of the panel, then it is turned over for a 0.025- to 0.050-in.-thick finishing cut on the other side. Table travel is 60 to 90 ipm for roughing, 80 to 105 ipm for finishing cuts. Thickness of finished panel at gage points must be within 0.010 in. of specified dimensions, is usually held within 0.006 in. Surface finishes average 40 to 50 mu-in. when checked with a Profilometer



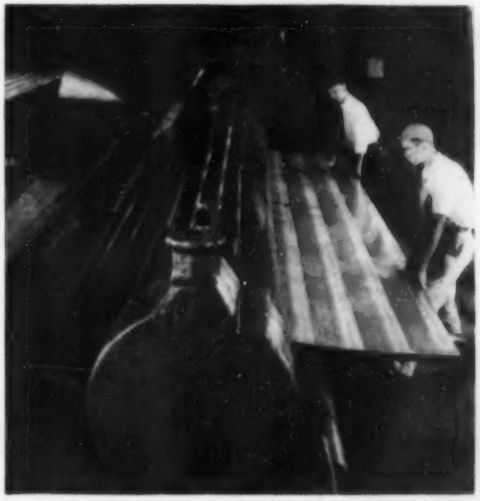
Cutter body for roughing and finishing cuts on skin-panel miller is 13-in.-dia, 4½-in.-thick SAE 102 HRS. It carries two 0.749-in. square carbide-tipped (Carboloy grade 883) bits ground with 15° positive back rake. Bits are set so cutting dia is about 11¾ in. Spindle is tilted forward so back side of cutter clears work surface about 0.006 to 0.010 in. and is tilted to one side for 0.002- to .003-in. clearance. Careful matching of 6- to 8-in.-wide cuts is important. Roughing cuts average ¼ in. in depth and sometimes dull bits so they must be changed before taking finishing cut, or second head on machine is used for finishing while first head is reserved for roughing operations. Finishing cuts are 0.025 to 0.050 in. deep and are taken at 3600 rpm because cutter is mounted directly on spindle of vertical 50-hp motor built into milling head

thick 75ST6 aluminum-alloy plate measuring 67 x 302 in. .When finished, this large skin section tapers from 0.300 in. thick at one end to 0.250 in. thick at the other. Thickest panel is machined from a 0.655-in.-thick plate measuring 33 x 286 in. This section tapers from 0.625 in. to 0.250 in. when finished. After taper milling, skins are contour-rolled to close tolerances in specially developed setups.

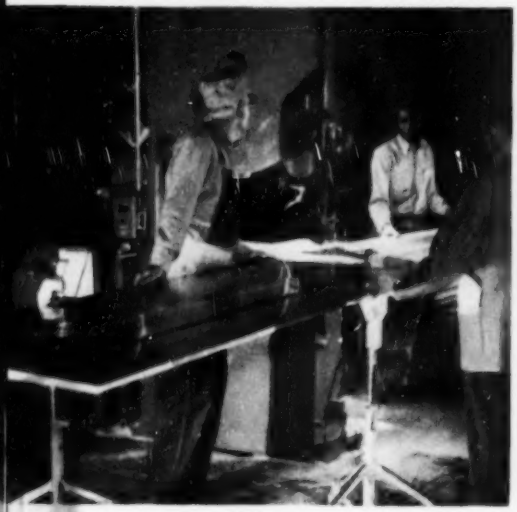
Minimum Metal Removed

Aluminum-alloy rolling mills now are producing taper-rolled skin plates which minimize the amount of metal to be removed when surface-milling tapered skin sections. They may eventually eliminate the taper-milling operation, but at present some milling still is necessary.

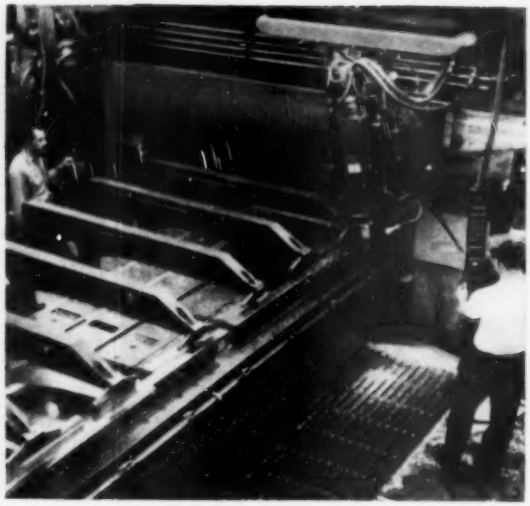
The operations shown here have been developed over the three years which have elapsed since the first skin miller was installed at Wichita. Their value has been proven by the high-efficiency B-47 bombers already delivered to the US Air Force, and by the high rate at which these bombers are coming off the assembly lines in Wichita.



Both taper-milled and flat wing-skin panels are formed to airfoil contour in this 154-ton Bertsch pincher-type bending roll powered with a 100-hp dc adjustable-speed motor. The 75ST6 aluminum alloy used for wing panels has roll-forming characteristics similar to spring steel, so accuracy of contour obtained depends upon skill of operator. He must gradually roll and re-roll each panel to fit the contour to templets. Each panel usually requires 3 to 4 passes. The three 25-in.-dia rolls will form skin panels up to 30 ft long. Excess stock must be left on each side of panel to permit rolling to edge of finished panel area

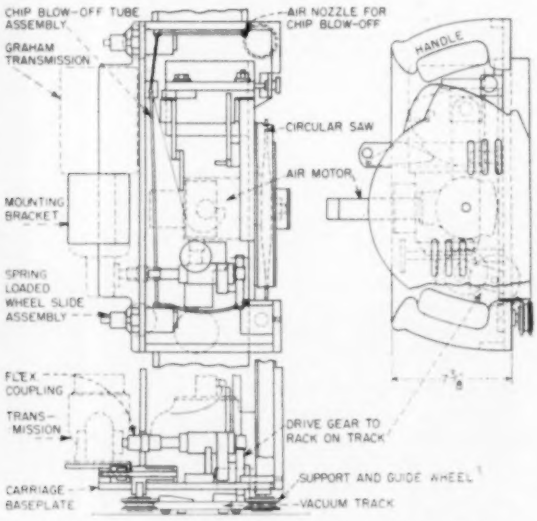


Contour-rolled skin panels go to a templet table where profile is scribed in alignment with a spar line marked by the roller operator when he has gaged the contour. Excess stock outside the contour scribed lines then is trimmed off with a 35-in. Crescent bandsaw as shown. For this operation, the panel is clamped on adjustable supports which make it easy to position it in front of saw

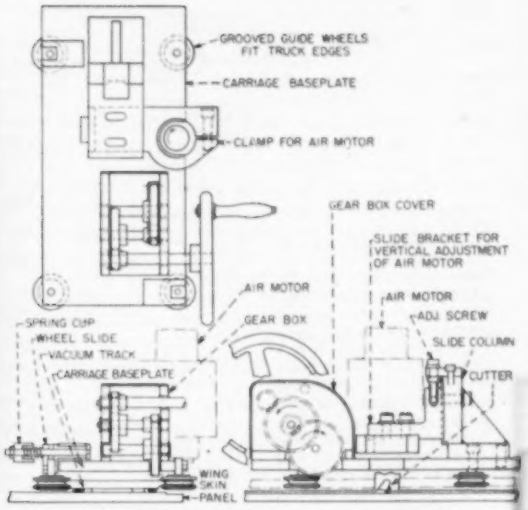


Rough-sawed skin panels are clamped to the table of Cincinnati Hypro skin miller for trimming edges accurately to size. Edges of panels which match leading and trailing wing surfaces also are step-milled in these setups. Carbide-tipped end mills are used at 3600 rpm. Mill shown also taper mills surfaces of skin panels using vacuum chucks as previously described

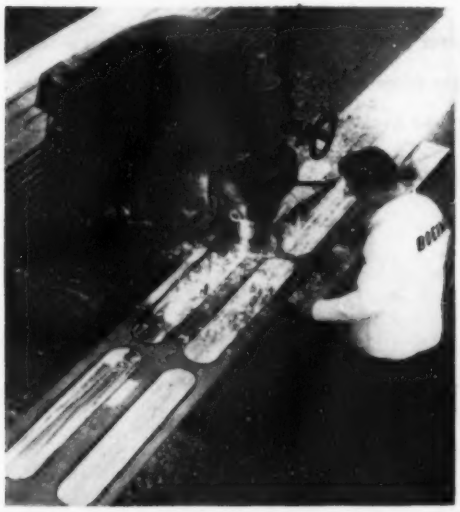
Because large planer-type miller employed for trimming and step-milling skin panels also is required for taper milling these panels, an alternate trimming method has been devised by Boeing engineers. Shown is a self-propelled sawing unit in which a 12-in.-dia circular saw is driven by a No. 4 Ingersoll-Rand air-grinder motor at 3800 rpm. Rail that guides saw carried is held on panel against stop pads with vacuum cups formed by half-round strips of synthetic rubber cemented to underside. Table supporting skin panel has contoured blocks to hold edge to be sawed in horizontal position. Saw is traversed by gear mating in 16-pitch rack on upper surface of vacuum track. Gear is driven by a ½-hp motor through a Graham adjustable-speed transmission mounted at rear of carriage. Right-angle-drive air-grinder motor carrying circular saw is mounted in center of carriage as shown. Special gage aligns track sections when long panels are to be sawed or step milled



Self-propelled step miller devised by Boeing engineers to ease load on planer-type miller has an Ingersoll-Rand air motor to drive a small carbide-tipped cutter and is designed to travel on the same track as that used for the edge-trimming saw. Cutter speed is 6,000 rpm. Steps on leading and trailing edges of skin panels must be held within plus 0.005 in., minus 0.003 in. Pump providing vacuum of approximately 27 in. of mercury under carriage track is mounted under table

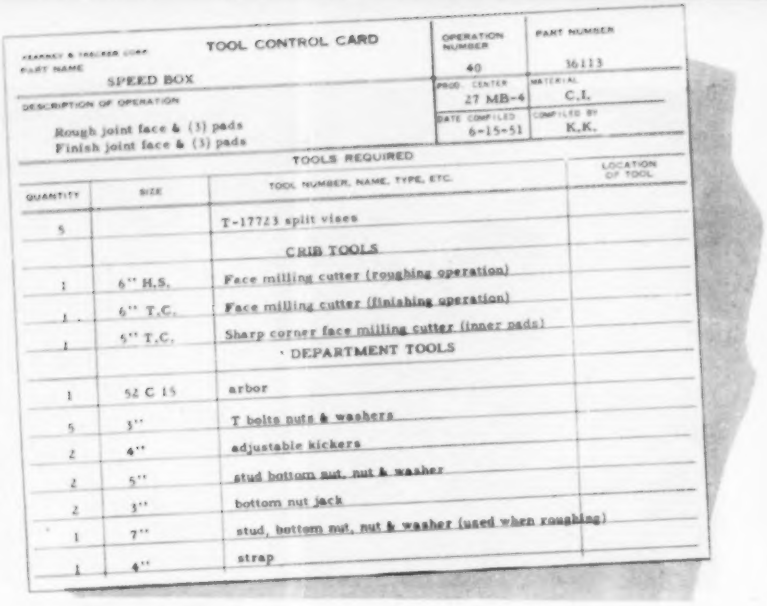


Portable end-milling carriage for cutting steps on wing-skin panels has hand-driven gear train for traversing carriage along track. A No. 4 F6D Ingersoll-Rand air-grinder motor is held vertically in an adjustable clamp which permits precise setting of cutter depth



Lightening grooves are cut in one surface of the forward inboard panel for each wing assembly, using a No. 4 K & T vertical mill with a 6-in.-dia single-bit flycutter. Carbide-tipped bit shaped to cut a 0.135-in. radius in the groove edges is used at high speed with an average depth of cut of 0.045-in.

Profiles of most wing-skin panels for the B-47 Stratojet are finished with high-speed Onsrud routers. Contour-formed and rough-profiled skins are clamped to formed steel fixtures mounted on movable table beside router. Steel fixture base is faced with wood to prevent scratching the skin panel and to clear the guide roll on the cutter spindle. Router has two cutter heads, each powered with a 5-hp, 250-cycle, 14,830-rpm electric motor to drive the 19/64-in.-dia inverted-taper HSS router bit. After routing, profile edges are hand finished to remove burrs and break edges. Any scratches formed during preceding operations are sanded out carefully. Then the skin panels are anodized and given a coat of primer before going to the wing-assembly jigs, where mounting holes are drilled



TOOL CONTROL CARD

PART NAME: SPEED BOX	OPERATION NUMBER: 40
	PART NUMBER: 36113
DESCRIPTION OF OPERATION: Rough joint face & (3) pads Finish joint face & (3) pads	PROD. CENTER: 27 MB-4
	MATERIAL: C.I.
	DATE COMPILED: 6-15-51
	COMPILED BY: K.K.

TOOLS REQUIRED

QUANTITY	SIZE	TOOL NUMBER, NAME, TYPE, ETC.	LOCATION OF TOOL
5		T-17723 split vises	
		CRIB TOOLS	
1	6" H.S.	Face milling cutter (roughing operation)	
1	6" T.C.	Face milling cutter (finishing operation)	
1	5" T.C.	Sharp corner face milling cutter (inner pads)	
		DEPARTMENT TOOLS	
1	52 C 15	arbor	
5	3"	T bolts nuts & washers	
2	4"	adjustable kickers	
2	5"	stud bottom nut, nut & washer	
2	3"	bottom nut jack	
1	7"	stud, bottom nut, nut & washer (used when roughing)	
1	4"	strap	

Tool control card lists all tools required for one operation on a given part. Included are special jigs, fixtures, and tools; sizes of standard perishable tools such as drills, reamers, and cutters; and setup tools such as vises, angle plates, clutches, studs, straps, jacks, and so on. Card is basis of system that gives operator 100% service and permits him to spend full day on production work at his machine

ONE BASIC CARD CONTROLS ALL TOOLS

Designed particularly for job-lot production, this system cuts machine downtime and eases the foreman's tooling headaches. One basic card gets tools to machine and back to crib again without operator effort

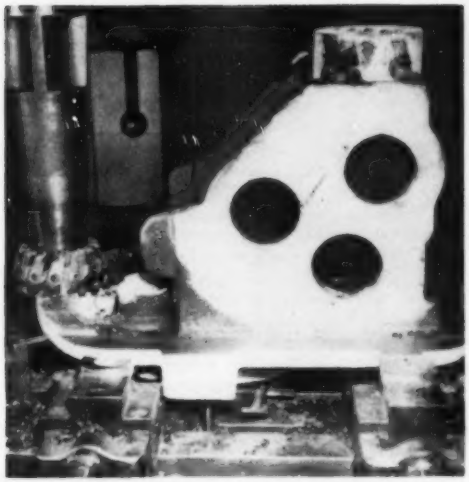
BY WALTER HUBBES, Manager of Process Engineering
KEARNEY & TRECKER CORPORATION, Milwaukee, Wis.

Our shop often produces orders ranging in size from 5 to 40 pieces. Setup changes are frequent and, under old system, it was expected that some time would be lost in locating tools for specific operations. Installation of an incentive pay system, however, high-lighted lost-time delays and gave us some idea as to just how serious our loss was. While exact figures are not available, a conservative estimate is that 10 to 12 minutes were lost per job, even on small setups. To minimize this waste of machine capacity and operator time, we decided to establish an improved tool-control system.

Now, under the new system, virtually no time is lost obtaining tools, machine downtime is greatly reduced, and the departmental foreman spend much less time overcoming tooling troubles. In addition, tools are ready before they are needed, are kept in better condition generally, and we know at all times where all tools are.

To obtain these results, our system is based on five major features: (1) All tools for each recurring operation are specified. (2) All tools are identified and their location is recorded. (3) Records establish the location of tools in use. (4) A definite procedure is followed for obtaining and returning all tools. (5) Tools are inspected and, if necessary, are reconditioned when they are returned to the crib.

As it is uneconomical to store a complete set of tools for every part machined in small- to medium-lot sizes, all tools are placed in one of three categories: (1) Jig Room Tools—Special jigs, fixtures, and cutting tools which are necessary to machine a certain piece of work. (2) Tool Crib Tools—Standard perishable tools, such as drills, reamers, taps, etc, which can be used on many jobs. (3) Department Tools—Standard vises, angle plates, sleeves



Milling setup on cast-iron speed box is described on tool control card illustrated. All three categories of tools are required, the T-17723 vises being Jig Room items. All tools are provided before they are needed. Card shows tool handlers just what operator requires

and machine attachments normally kept at the machines in a department. Tools in each category are stored only in the location designated for that category and are moved in and out of storage, as required, by one basic tool card that lists all categories of tooling and is applicable to all production items and to all operations.

Tool cards are prepared for all small-lot production that requires several kinds of tools and accessories. While we attempt to cover the major part of our production with tool control cards, it is not practical to cover all items. Some require simple tooling and repeat only once every two years; other items are very simple, perhaps requiring only a lathe chuck and a tool that is a standard shelf item. We take these things into consideration and cover the jobs on which control benefits are worth while.

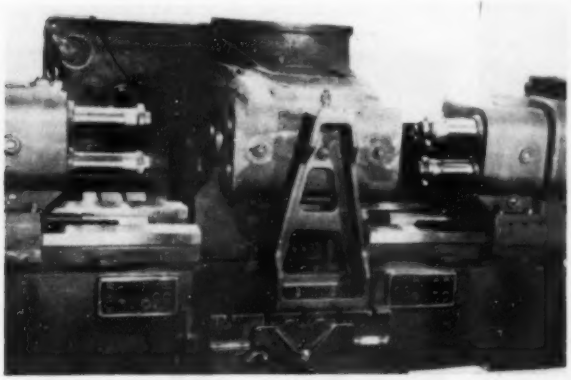
Tool cards also are prepared for special equipment such as the boring machine illustrated. In this case, production and accuracy requirements justify a special machine for boring several sizes of milling machine columns. As different heads are required for each size column, tooling in the category of Jig Room Tools is extensive, and cards are helpful. However, most jobs in our shop do not justify such a setup and it is on these small- and medium-lot jobs that tool control really pays off.

Cards are typed from a preliminary tool-control sheet prepared by tool-control men. This is done from the job process sheet, the part drawing, and by actually viewing the setup. Duplicate cards are typed, proofread, and given a protective plastic coating. One card is filed by part number and operation number in the Jig Room master file and the other is filed in the department which normally performs the operation. The original preliminary sheet is filed in the tool-control man's file.

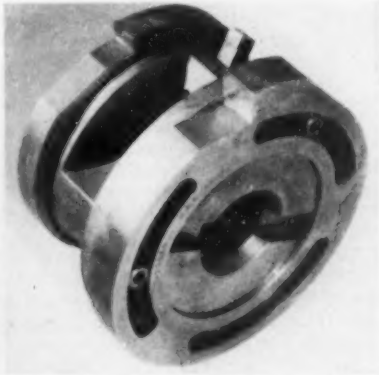
How to Obtain Tools

When a foreman assigns one or more operations to a machine, he initiates the following procedure:

1. Either the foreman or a clerk removes the tool card from the department file and replaces it with an "out" card which shows the part number, date of removal, and operation number.
2. Tool Card is sent to Jig Room.
3. Jig-room attendant withdraws jigs, fixtures, and special tools identified by tool number.
4. Tool-crib attendant withdraws perishable tools,



Special boring machine roughs and finishes several different size milling machine-columns, boring the overarm, spindle, and shaft holes simultaneously. For each size column, separate head is attached and engages machine drive. As spindle positions are fixed, location and alignment of bore is assured. Special cutter gives up to 30 pieces between grinds



Finishing cutter on special boring machine holds accuracy of finished bore within ±0.0001 in. Outer rings to which carbide cutting tips are brazed are mounted on eccentric seats to permit fine adjustments for size

placing them in tote pan or on pallet carrying jig-room tools. These tools are selected according to specifications on the tool-control card.

5. Jig-room attendant dates and places his master card in an "out" file. The department tool-control card always accompanies tools which are not in storage.
6. Jig-room attendant transports all tools along to department requesting such tools and leaves them in an incoming-tool area in the department.
7. Department helper places departmental tools with the storage room's tools and, at the proper time, moves them to the assigned machine.

Thus all tooling and equipment necessary to perform a particular operation are ready and at the machine when the operator needs them. Skilled operators can spend a full day at their machines where their skill can be applied to best advantage.

How to Return Tools

1. When an operation is complete, the machine operator places all tools and equipment back on the pallet or in the tote pan along with the departmental tool control card. This card is held at the machine while tools are in use.
2. Department helper stores department tools and moves pallet or tote box to outgoing-tool area in the department.
3. Jig-room attendant moves outgoing tools to the tool-inspection department the next time he brings in a load of requested tools.
4. Tool inspection counts and checks tools received against control card and segregates these tools needing sharpening, repair, or other attention.
5. Tool Inspection returns all tools, special and perishable, to jig-room attendant. He stores, in their proper location, tools identified by tool number, sends tools requiring repair to the toolroom, and records this action.
6. Perishable tools are inspected for count and sharpening and are stored in their proper location in the tool crib by the crib attendant.
7. Tool-crib attendant returns department tool-control card to the jig-room attendant who then moves the jig-room master card from the "out" to the "in" file and returns the department card to the department from which it originated.

While this procedure may seem involved, actually it is not. After the tool control card has been made up, steps are more or less automatic and much of the work can be performed by unskilled or semi-skilled help.

We have one major tool crib, which includes the jig room, for the entire plant. There also are three small tool-crib installations that handle small sections of the plant and were set up primarily because of the distant locations of these sections.

Coordinated Tool Data System

Our shop has a number of departments that do typical lathe work, several that do typical milling work, and others that do typical grinding work. Many times in the past, one department would duplicate general-purpose tooling that already existed in another department but was not properly recorded. Along with the tool control system, a coordinated tool data system has been developed. This helps the tool control men immeasurably and reduces the duplication of tooling that has always been, and still is, a problem in many factories.

Tool control men have taken inventory of general-purpose tooling in these departments, have assigned tool numbers, and have recorded all of this information in data books. Now, when an operation is being tooled, if the tool control man needs, for example, a specific size lathe mandrel, he has the tool number and location, if other than the Jig Room, right at his fingertips in the Tool Data book. This system has resulted in greater use of tooling already in existence and has reduced the expense of duplicate toooling. Particular attention also is paid to recording the use of general and special carbide lathe tooling. The objective is to stabilize as much as possible, yet obtain optimum utility from carbides, because of their cost.

While extra help is required to operate this system, the cost is considerably less than the expense incurred through machine downtime, lost tools, duplicate tools, and excess tooling inventory, not to mention lost tempers.

First introduced by A. K. Wilson, assisted by H. R. Langlois, Renald Zemke, and William Giuntoli, this tool-control system was instituted approximately two years ago and is not yet installed completely throughout the plant. Improvements of the system have been going on constantly and without a doubt will continue to be made. Though we know that our system of tool control is far from perfect, we feel that companies with tooling and production problems similar to ours might benefit with a like procedure.

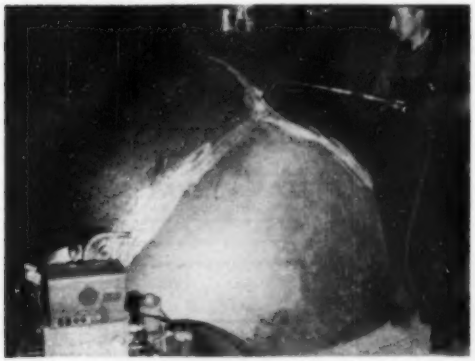
"We aren't being so fussy any more, Doctor. If they can walk through the door, they're hired."

PEROXIDE TANKS POSE WELDING PROBLEMS

Two different welding methods are used for inside and outside seams to combine high purity and high speed

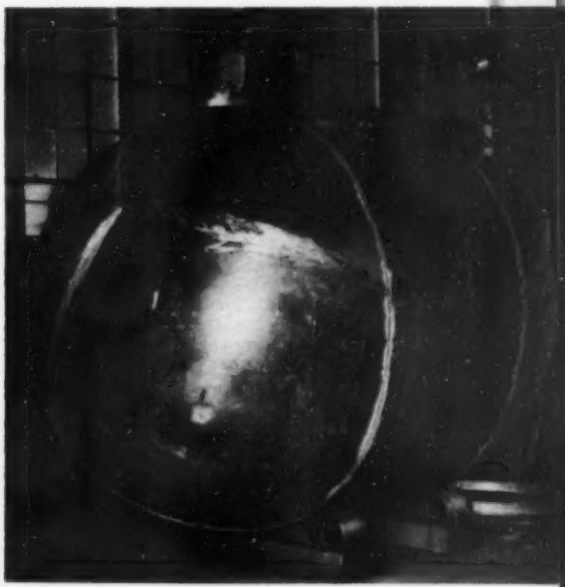
BY W. F. SHEFELTON, Production Mgr.
R. D. COLE MFG. CO., Newnan, Ga.

1 **Hemispherical head** for hydrogen-peroxide storage tank made from $\frac{3}{8}$-in. high-purity aluminum. Inside seams are Heliarc welded to within 8 in. of rim to allow for fitting to the cylindrical shell



2 **Outside seams** are preheated with a gas-welding torch to 300 F prior to welding. Preheating offers minimum porosity, better penetration, and better weld contour because the deposited metal flows more smoothly

3 **Head seams** are sigma welded on the outside, the power-feed unit being suspended from a hoist. This process was not used for internal seams because higher-purity rod (EC Grade) was not available in coils for sigma welding



4 **Circumferential seams** are sigma welded after inside has been Heliarc welded with high-purity rod. Another reason for Heliarc is that it was easier to compensate for fitup difficulties in the construction of these vessels

WE BUY TOOLS FROM PAST PERFORMANCE

Here is a plan to check on the part produced per grind and total life of various makes of identical hobs and reamers. Results at Chevrolet-Muncie have been improvements in gear cutting and finishing and better tools from the vendors

By JOHN M. FINALLY, Master Mechanic,
CHEVROLET-MUNCIE DIV., GENERAL MOTORS CORP.

Spot-check studies showed us that cutting tools purchased from different suppliers often give widely varying results in terms of pieces produced even when used under identical conditions. We therefore initiated a statistical control plan for recording and analyzing tool-life data in the departments producing gears for Chevrolet transmissions.

Important results have been achieved in little more than a year—improved gear-cutting and finishing and better tools from the vendors. Copies of the quality-control charts are sent out to vendors as a measure of the quality of the tools they have been supplying. In addition, charts of other makers are shown them without identifying the name.

To date, only hobs and broaches have been studied. But steps are being taken to apply the same procedure to the study of gear-shaper cutters, gear-shaving cutters, diamond grinding wheels, and diamond dressers. We are also considering applying the plan to various carbide-tipped single-point tools used in large quantities for turning, facing, and boring gear blanks and transmission shafts.

Special gages have been developed for measuring hob teeth to determine the amount of metal ground off cutting faces at each resharpening. Each hob is measured when new and after each grind and the measurements recorded on the hob data card.

1 **A serial number** is electrically etched on each hob under study. The number is synthetic so the maker cannot be identified when a vendor is shown the final results. One tooth is also marked so it can be measured each time the hob is resharpened

PART NAME Hob CUTTER NO. #28
PART NO. MC-400-4 MFR. 194765
DATE REC'D 10-13-50 SIZE B. G. .884

SIZE A. G.	DATE OUT	SIZE A. G.	DATE OUT	SIZE A. G.	DATE OUT	SIZE A. G.	DATE OUT
.879	.668						
.852	.647						
.820							
.801							
.777							
.772							
.725							
.699							

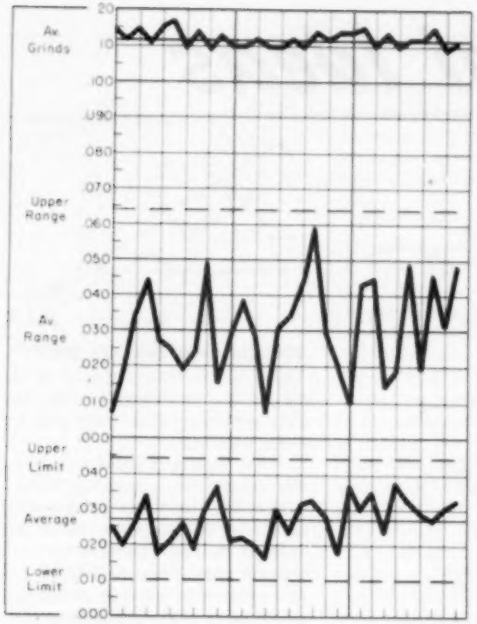
2 **Thickness of marked tooth** is measured after resharpening and this dimension recorded on a hob data card as shown. Amount removed per grind is obtained by subtracting tooth-thickness dimensions after each grind. Information is then transferred to a record sheet in master mechanic's office after tool has been discarded

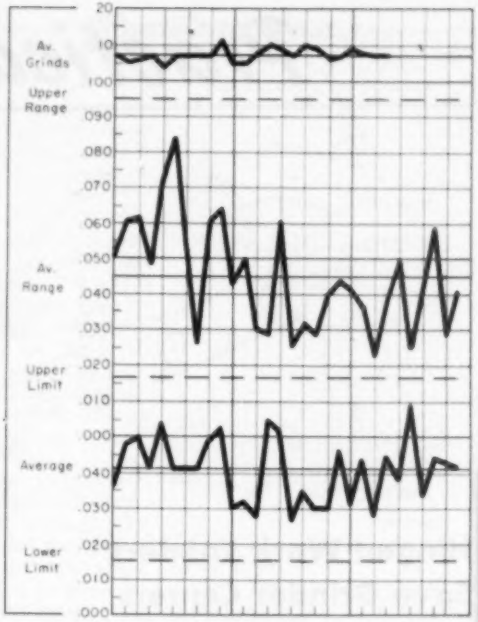
RECORD SHEET FOR MEASUREMENTS

PART NO. Mc-400-A PART NAME Hob - Mfgr. 194765 PLANT #1
CHARACTERISTIC MEASURED Cutter-stock Removed/Grind DATE RECORDED 12-18-50 BY HJW
UNIT OF MEASUREMENT: Thousandths ZERO SETTING

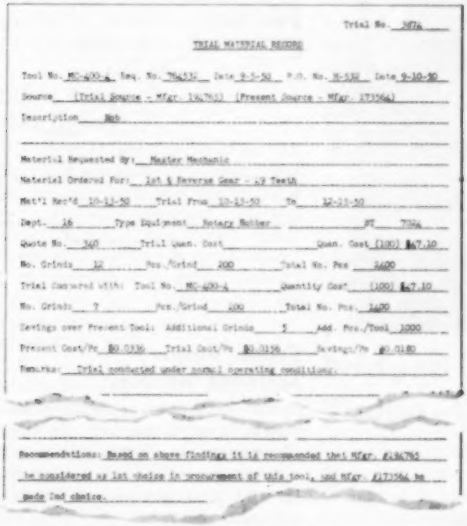
Series	Date (and hr.)	Measurements of each of five items in series					Average for Series	Range for Series	Grind; Other Information
1		15	27	32	19	43	.23	17	10
2		25	17	26	31	44	.26	18	12
3									
4									

3 **Standard "Record Sheet for Measurements"** is used for collecting data such as pieces produced per grind and cutter stock removed. Measurements are recorded in series of five per line, then the average and range (lowest subtracted from highest) for each line are calculated and recorded. Only five consecutive measurements are recorded for each hob when a series of tools from a given manufacturer are to be studied





4 Data from the record sheets are charted, using conventional statistical control. Identical hobs made by different suppliers can then be compared. Chart at left shows almost twice as many grinds per hob as does one at right. The two lower graphs have hob stock removed per grind along vertical axis. Range and average are for series of five grinds. Charts are also used for broaches but with parts per grind along the vertical axis



Trial No. 347a

TRIAL MATERIAL RECORD

Tool No. MC-400-A Req. No. 764336 Date 9-5-50 P.O. No. M-532 Date 9-10-50

Source (Trial Source - Mfgr. 1347561) (Present Source - Mfgr. 1731564)

Description Hob

Material Requested By: Master Mechanic

Material Ordered For: 1st & Reverse Gear - 49 Teeth

Mat'l Rec'd 10-13-50 Trial From 10-13-50 To 12-13-50

Dept. 16 Type Equipment Rotary Hobber ST 7304

Quote No. 340 Trial Quan. Cost Quan. Cost (100) $47.10

No. Grinds 12 Pcs./Grind 200 Total No. Pcs 2400

Trial Compared with: Tool No. MC-400-A Quantity Cost (100) $47.10

No. Grinds 7 Pcs./Grind 400 Total No. Pcs. 2800

Savings over Present Tool: Additional Grinds 5 Add. Pcs./Tool 1000

Present Cost/Pc $0.0336 Trial Cost/Pc $0.0196 Savings/Pc $0.0140

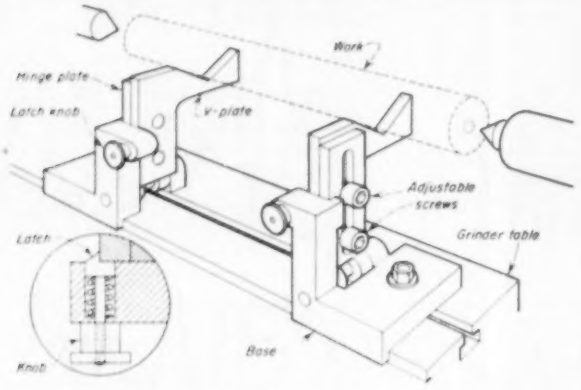
Remarks: Trial conducted under normal operating conditions.

Recommendations: Based on above findings it is recommended that Mfgr. #1347561 be considered as 1st choice in procurement of this tool, and Mfgr. #1731564 be made 2nd choice.

Trial runs of tools from another maker are compared with hobs in present use. In this case, pieces per grind and number of grinds were the criteria. Charts obtained from these trial runs are often sent out to the vendors as a measure of the quality of tools they have been supplying. Note that five additional grinds were made over present hob, with savings of almost 2¢ per piece

Performance tag accompanies each broach, so record can be made of each resharpening and the number of pieces between grinds. This method is used because of the difficulty in measuring the amount ground off broach teeth at each resharpening. End of broach is etched with symbol identifying shift on which it is resharpened. Thus tag shows who is responsible for a bad grind

Practical Ideas

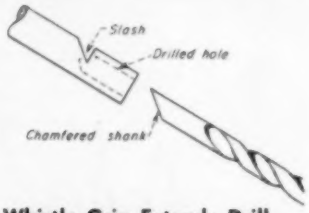


Hinged Work Loaders Save Grinder Centers

CYLINDRICAL GRINDERS are difficult to load when the work is long and heavy. For such cases, I have built a work support that clamps to the grinder table and can be adjusted for many different jobs. It prevents damage to work and machine centers and speeds loading the work, especially during batch production.

The V-notched supports are assembled with bolts to the vertical hinge plates, which can be dropped down flat to clear the work after it has been picked up by the machine centers. Latched pins hold the hinge plates upright when work is being loaded.

The latches are simple shouldered extensions that are tapered on the side away from the hinge plates. The knobs must be pulled to release the plates, but the plates will snap back into position when returned upright because of the taper on the latches. *Tom Brown, Perivale, England.*

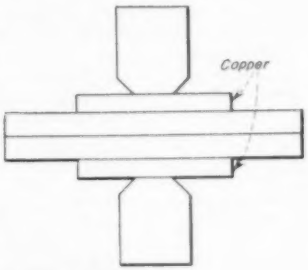


Whistle Grip Extends Drill

DRILL A ROD that is about ⅛ in. larger than the drill to take the drill with a snug fit. Then make a setup on a miller.

First, mount a bevel cutter on the arbor, then clamp the extension in the vise. Gash the extension as shown, breaking into the drilled hole at its end. Remove the extension, and clamp the drill in just the same way, cutting off its end at the same angle as the extension.

The wedge end of the drill will poke through the gash in the extension to bear on the angled flat, providing absolute keying. If the parts are small, this work can be done by filing instead of milling. *P. Dawson, London, England.*



Copper Strips Spotweld Stainless

AFTER TRYING to spotweld stainless-steel parts together, we were stumped because they just would not weld—perhaps because of the metallurgical composition of this particular steel.

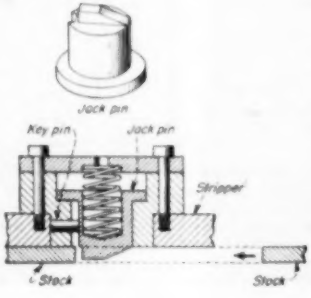
Two strips of fairly thick copper were placed between the work and the electrodes. Results were fine. This method is now utilized on all stainless spotwelding jobs. *R. G. Vare, Christchurch, England.*

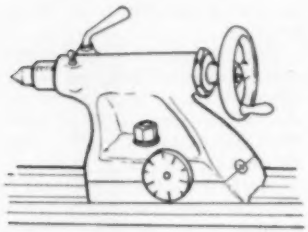
Inclined Jack Pin Registers Press Stock

WHERE STRIP STOCK must be pulled back at each stroke of the press to guarantee register, this jack pin works to both pass new stock and stop the piece under the punch.

The pin itself is round and shouldered, with a ramp cut on its end. In the die, the ramp end is down, facing the new stock coming into the press. A short pin in a horizontal hole in the fixture base rides in a vertical keyway in the jack pin to keep the jack pin pointed in the right direction.

As the stock feeds to the left, it raises the jack pin against spring pressure. After passing, it allows the pin to drop. Then the stock is pulled back against the edge of the pin into register. *Donald Zuerl, Fulton, Mo.*

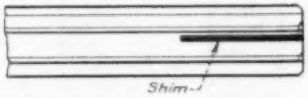




Taper Indicator Added to Tailstock

LATHES that have tailstock-offsetting devices to allow taper-turning often have no readable dials attached to the screw in the tailstock. To such a lathe I added a dial.

The screw had 16 tpi, and the dial was marked on a dividing head to 10 divisions; therefore, each division on the dial equalled an offset of 0.00625 in. The same kind of arrangement can be added to other lathes with practically any number of divisions on the dial—whatever is convenient. *Olin C. Brage, Tieton, Wash.*



Shims Enlarge Hole Tools

TAPS AND REAMERS pile up by the dozens at our screw machines when we work on brass and bronze parts —all slightly undersize. To get more use out of the tools, we slot them with a resinoid cutoff wheel and insert shims to spread the cutting edges. The shims may be tapered slightly; larger at the front edges of the tools.

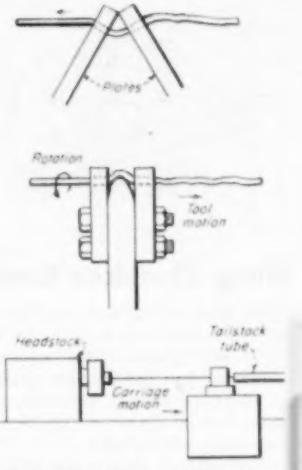
Reamers and taps for special jobs where the holes are slightly over standard size are easily made this way. The slot should be about an inch deep, cut with a 1/32- or 1/16-in. wheel. The shims spread the tips, which makes the end of each tool do all the work; therefore the edges do not last as long this way as they do on new tools. However, we still get a lot of additional service out of them—all in addition to normal service. *Rudy Martinka, Chicago, Ill.*

Straightening Wire

PASSING WIRE through plastic deformation while it is under tension is the best way of straightening it. Here are two methods for doing the job:

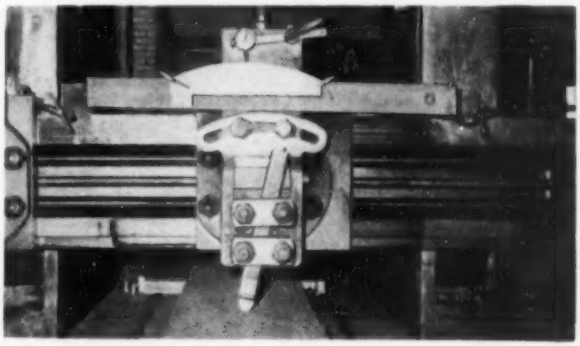
For short lengths, drill holes through the ends of two flat pieces of stock and pass the end of the wire through them. The holes should be slightly larger than the wire OD. Then chuck the end of the wire, spread the blocks as shown, and pass them down the length of wire. The plates can be hinged together for convenience in drilling the holes and in operating the straightener.

For coiled lengths, chuck the end after passing it through a straightener on the lathe carriage. The chuck can be released, the carriage backed up, and the wire passed through the spindle to move the wire. Actual straightening is done by moving the carriage toward the tailstock with the wire clamped in the chuck. The tool has two plates



with holes, plus a rounded nose between them.

Stock for both tools should be softer than the wire to avoid scratching. Brass or laminated plastic may do. *Haim Murro, Cambridge, Mass.*

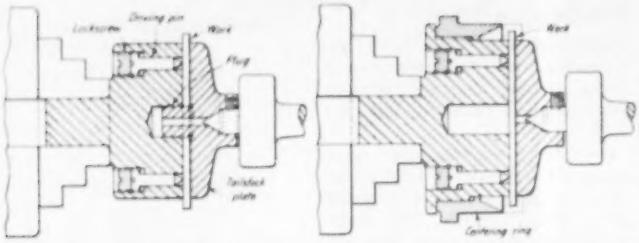


Bridged Templet Guides Radius-Cutting Planer

A LONG STEEL SLAB, 3¼ in. thick, 14 in. wide, and 10 ft long, had to be planed to a 16-in. radius. The setup was made on a 14-ft Whitcomb machine.

A steel templet was first made, full size. This was clamped to a bracket that bridged the toolslide between opposite ends of the crossrail. A dial indicator was attached to the toolslide so it bore on the templet. Tooling was standard.

Automatic horizontal feed was engaged. Each time the table was fully extended and the crossfeed had moved, the indicator read a few thousandths off, so the toolslide could be adjusted by hand to bring the indicator back to zero. *Ralph J. Rossi, E. Boston, Mass.*



Ring Chucker Centers Automatically

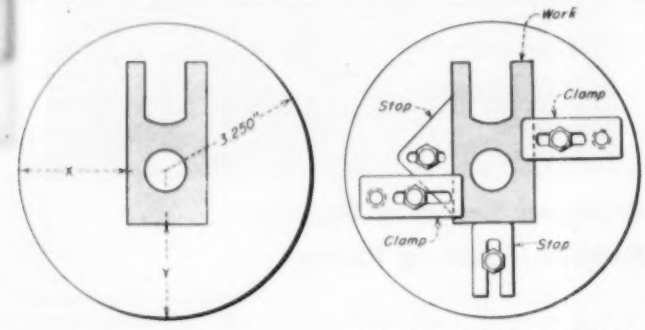
SOFT BRASS RINGS with an OD of 4¼ in. and a thickness of 3/16 in. were the product held by this chucking rig. The fixture design is adaptable enough, however, for many other kinds of ring work, including solid plates.

Two models shown are practically the same except for centering devices. The left-hand one is for rings, so a plug in the tailstock plate is made to fit inside the ID of the ring, thus centering it. The right-hand model is equipped with a threaded ring on the outside of the body. This is advanced to center the work by its OD when there is no central hole. The tapered counterbore will allow some variation in the work OD without losing the ability to center the work.

Each headstock has a flat gripping surface. Two or three hardened and ground steel pins, cut to setscrew shape, but with threads on the OD of the heads, are adjusted to dig into the work slightly to provide positive driving force. These pins are locked by short lockscrews.

Both tailstock plates clamp on the tailstock center, and have flat gripping surfaces, too. Pressure from the tailstock insures positive gripping and work location.

The centering collar (right, above) is threaded right-hand so it can be quickly retracted to clear the work when the chuck is started. The operator simply holds it temporarily until the chuck threads it back against the shoulder on the headstock holder. *W. M. Halliday, Southport, England.*



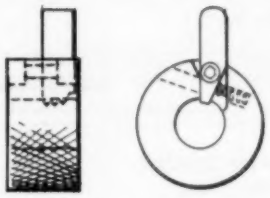
Faceplate Stops Speed Boring Work

PRECISION BORING can be done on the lathe if hole location is from two edges of the work, as in this case. The U-shaped piece had to be bored out in the middle, with the center of the hole a precise distance from both left-side and bottom edges of the piece.

With two stops on the faceplate to control work location, the piece was clamped with straps. For a small quantity of pieces, the only setup alterations were relocating the boring tool after each tip regrinding.

Stop location and alignment was critical. The faceplate was set up originally on a bench, where accurate measuring could be done. We knew the diameter of the plate (6.500 in.) and the required dimensions from the work edges to the centerline. Dimension X was 3.250 in. minus A, and dimension Y was 3.250 in. less B. The X dimension was set first, the stop located, and the piece roughly clamped. Then the Y dimension was set by locating the other stop, and the work reclamped. For checking, we measured over from the reference edges to the opposite edges of the faceplate. The stops had to be at right angles to each other, and the check dimensions across the plate had to be right.

After this, the faceplate was mounted and work started. *Lauri Ayala, Cranston, R. I.*



Coil-Winder Speed Nut Has Lever Control

A QUICK TURN of the nut after it is slipped onto the coil-winder mandrel is all that is necessary to lock it into position. Reversing the process disassembles it.

The nut is a round one, drilled to fit the mandrel. The outside is knurled for easy handling. A lever with chaser-like threads on its end is seated in a slotted-out recess in one side of the nut. The lever pivots on a bolt that is assembled with a locknut that fits in a counterbore on the opposite side of the nut.

A hole is drilled almost through the nut at a slant to take a small coiled spring. This acts against the lever to keep it tight on the mandrel, and is held in place by a small pin on the lever. *William Richter, West Haven, Conn.*

Old Micrometer Makes Height Gage

FOR PRECISION LAYOUT and inspection work, a micrometer that has worn anvils (but not badly worn threads) can be converted into a precise height gage.

A counterbored bushing fits over the bottom (annealed) end of the spindle. The pointer, which is carbide-tipped, fits over this bushing, and a collar is attached to the bottom of the assembly with a screw into the spindle. For extra support, an auxiliary rod is assembled through the micrometer frame. This fits the pointer, which rides up and down on it.

The anvil is ground off, and the bottom of the frame is ground square with the spindle. To this a heavy steel block is screwed, and the block is ground on the bottom. By grinding the block to exact size, the micrometer can be made to read zero when the carbide tip of the pointer is exactly an inch above the bottom of the base.

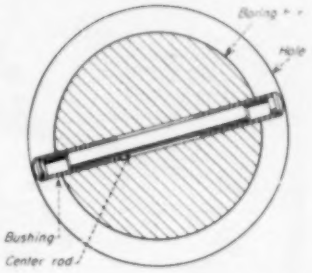
The gage reads from 1 in. to 2 in., now, and is used with gage blocks to find any height over 2 in. Blocks are set under the gage to jack it up to the level of the work. Heights under 1 in. can be found by jacking the work up on a 1-in. gage block. *P. Opanowicz, Newark, N. J.*

Boring-Bar Hole Gage Centers Automatically

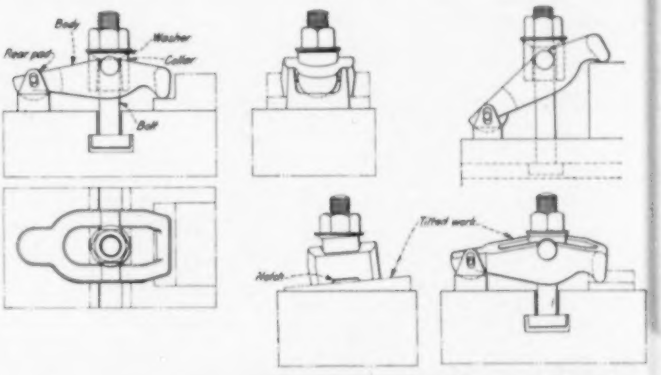
CLOSE MEASUREMENTS are possible with this gage because it must be located through the center of the boring bar when it is first installed; therefore it gives accurate readings.

It consists of two split bushings, two hardened caps pressfitted into the ends of the bushings, and a center rod. The bushings are made to slip on the center rod, but not too easily. The ends of the caps are rounded.

The gage is assembled into a hole through the boring bar, preferably just behind the tool. After a cut is



started, the boring bar is backed out until the gage clears, and the bushings are pulled out slightly farther than the OD that has been cut. The bar is advanced slowly into the work, which collapses the gage bushings. The bar is withdrawn again, and a micrometer reading is taken across the plugs. *A. Vetsch, Steffisburg Station, Switzerland.*

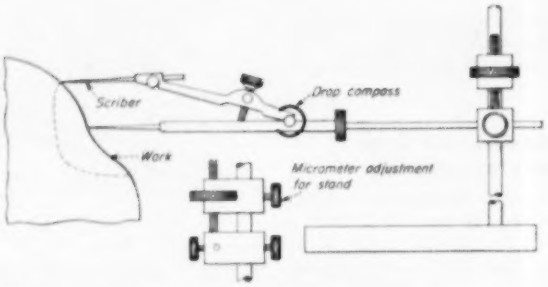


Universal Clamp Adjusts for Any Height

WORK of practically any height within reason and with an angled top surface can be clamped with this universal device. Its forged-steel body has great strength, and the design has good stability.

A T-slot bolt through the middle of the body takes the tension of clamping. This is assembled with a large hex nut, a washer that has a convex lower surface, and a collar equipped with turned pivots on the side and a dished top surface that fits the washer. The curved surfaces allow considerable swivel of the body with full, equal force exerted by the collar and pivots.

The front clamping pad is notched so it will level easily on the work. The rear pad is a shaped piece with a flat bottom and a dished inside surface that nests around the rounded end of the body. This allows swivelling. The sides of the rear pad are slotted to take a pin through the body. *Hjalmar Dahl, Upplands—Vasby, Sweden.*

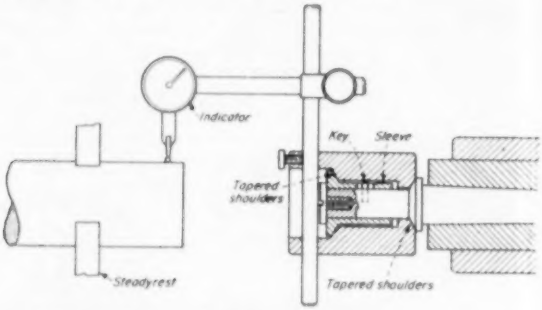


Scribing Circles on Castings

LAYOUTS OF ROUND HOLES on irregular work surfaces are always a problem; often solved by making a cylinder to fit the irregular shape so its OD can be traced. This method is tedius and not too accurate, however, and we get around it by using the illustrated compass.

Support is from a surface-gage base. A horizontal rod is aligned along the required centerline of the hole, pointing to the work, and the scriber is rotated. It slides back and forth on the support rod, allowing for the irregular shape without losing the true circle.

The tip of the horizontal rod can be sharpened so it can be forced against the work to provide sturdy support. A micrometer-like adjustment on the gage permits close adjustment of the rod in the vertical direction. *Lester J. Pech, Manitowoc, Wis.*



Checking Steadyrest Setups

THE DIAL INDICATOR on this adapter can be rotated all the way around the end of a piece of work to check its concentricity with the tailstock; and therefore check the aligment of the axis of the work.

A regular tapered shank fits the tailstock spindle. This has a tapered shoulder on it, against which a matching tapered shoulder of the rotating barrel fiits. A sleeve inside the barrel is keyed to the shank, and also has a tapered shoulder that mates against a similar taper inside the barrel. A screw with a wide head is assembled into the end of the shank so it will control the bearing pressure at these tapered junctions. For adjustment, the setscrew is released, and the dial-indicator rod is slipped out.

When the steadyrest is in place with the work inside it, the indicator is moved to indicate zero when it touches the work. Then the setscrew is locked and the attachment rotated around the work. Any variation from zero will indicate the direction and amount of misalignment, which can then be corrected by adjusting the rest. *Tom Brown, Perivale, England.*

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REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worrry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

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HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

146th Winner:

(For February 4, '52 issue)

L. Kasper

Drilling Opposed Holes

Average diameter of a hole
Bearing race matching
Angle between bore and face
Diameter
Thickness
Bore center distance
Crank throw, eliminating all error due to diametral tolerance
Twist
Bend
Typical Dimensions and Relationships measured with Sheffield
PRECISIONAIRE GAGES
Lobing or cloverleaf of a centerless ground shaft
Internal radial clearance
Flatness
Distance between hole centers eliminating all error caused by diametral tolerance
Center distance of incomplete holes eliminating all error caused by diametral tolerance
Sheffield
SHEFFIELD

Vanadium-Alloys

brand names

that deliver

Distinctive Performance

on your **cold work** die jobs!

Non-Shrinkable Colonial No. 6 — Non-Deforming, Oil Hardening Die Steel having excellent machining properties; low hardening temperature. Popularly used for blanking punches and dies, gauges, bushings, and miscellaneous tools.

Air Hard — 5% Chromium Steel with minimum distortion in air hardening. Especially adapted for better wear and toughness in thread rolling dies, form and blanking dies, punches, knurls, gauges.

Ohio Die — Air Hardening, High Carbon-High Chromium Steel. Free from movement in hardening, combines high wear resistance and toughness for difficult jobs. Your choice on trimming dies, shear blades, coining dies, rolls and mandrels.

Crocar — High Carbon-High Chromium Die Steel with outstanding resistance to wear. Can be either air or oil hardened. Select this grade for lamination dies, wear plates, slitting cutters, and forming dies.

Red Star Tungsten — An unusual Oil Hardening Die Steel. Maintains keen cutting edges; excellent for punches, taps, blanking dies, spinning tools, and slitters.

It pays to *buy by brand*——when the brand-name speaks for *extra performance on the job.* As makers of First Quality tool steels exclusively, we say: buy Vanadium-Alloys' steels by name—and get the values added to each composition by our *specialized process of manufacture* . . . values that are physical, measurable, and profit-making for you!

Vanadium-Alloys

LATROBE, PENNA.

Colonial Steel Division — Anchor Drawn Steel Co.

Cost of Grinding Carbide*

By H. W. WAGNER, NORTON COMPANY

To evaluate possible processes for machining cemented carbide, it is essential to know the total cost per unit of acceptable product. Total cost is the sum of tool cost, time cost and cost of spoiled work. For grinding costs with diamond wheels, quality and costs are given for commercial grinding without recourse to special equipment or methods. Here, the finest finish, 2 mu-in. (rms) requires a finer grit than used in rough grinding. Flatness of 0.0002 in. necessitates going over the work with decreasing feeds after rough grinding.

In Table 2, the periphery of the wheel was used in all cases, except items 9 to 12, where the working rim on the side of cup wheels was ⅛ in. wide.

In Table 3, under "wheel structure," *D* means diamond and the next figure is grit size. After the hyphen, the first letter is the grade, the next figure is the diamond concentration and the final letter designates the bond—M for metal bond, B for resinoid bond and V for vitrified bond. A higher concentration number means a higher volume percentage of diamond. Price per cu in. is based on maximum discount from present prices, and is the net price of wheel divided by the cu in. of diamond portion of the wheel. The fraction following the bond letter is the depth in inches of the diamond portion.

Table 1 .. **Surfaces Produced on Cemented Carbides**

Profilometer roughness	2 to 10 mu-in (rms.)
Flatness, surface ground	0.0002 in.
Chipping of cutting edges	0.0005-0.002 in.
Cracking of work surface	None
Burn on work	None
Pitting of work	None

Analysis of Results

Comparatively high cost of item 2 is due to relatively rapid wear of the 50-concentration wheel on this operation. Item 13 in the centerless group shows the lowest cost per cu in. of carbide removed because the wide face (3 in.) of the wheel permitted a fast rate of cutting without a high ratio of wheel wear to material removed. A faster feed rate was applied for item 14, and the wheel wear was far more costly. Surface grinding with the side of a cup wheel, items 9 to 12, proved costly, because the slow rates of cutting produced high time costs per cu in.

*From Report MAB-18M, a panel discussion on new processes for machining and grinding held by the Minerals and Metals Advisory Board.

Table 2 .. **Costs for Grinding Cemented Carbides With Diamond Wheels**

Item No.	Operation	Work Size	Production Per Hour	Costs Per Unit of Work: Wheel	Time	Total
1	Cut-off	0.32x0.511	15.8 sq in.	$0.42	$0.47	$0.89
2	"	section	16.2	2.96	0.46	3.42
3	"	"	34.2	1.33	0.22	1.55
4	Surface,	9 sq in.	1.225 cu in.	2.20	6.10	8.30
5	periphery	surface	4.37	7.87	1.70	9.57
6	Surface,	9 sq in.	1.20 cu in.	2.18	6.25	8.43
7	periphery	surface	4.39	8.03	1.71	9.74
8	"	"	4.62	13.65	1.62	15.27
9	Surface,	0.625	0.148 cu in.	10.98	50.60	61.58
10	side of	sq in.	0.148	9.30	50.60	59.90
11	cup	surface	0.1485	7.79	50.55	58.34
12	wheel	"	0.291	25.70	25.80	51.50
13	Centerless	1¼ to 2 in.	29.4 cu in.	4.71	0.255	4.96
14	Cylindrical	dia	50.9	26.70	0.147	26.85

Table 3 .. **Diamond Wheels Used in Cost Studies**

Item No.	Wheel Dimensions	Wheel Structure	Price Per Cu In. of Diamond Portion	Work Area Cut or Volume Removed
1	8x0.055X	D60-L100M ¾	$370	0.306 sq in.
2	"	D60-L50M ⅛	278	0.162 sq in.
3	"	D100-L100M ⅛	370	0.322 sq in.
4, 5	7x⅛x1¼	D100-N100B ⅛	197	0.52-0.55 cu in.
6-8	7x⅛x1¼	D100-L100V ⅛	230	0.52-0.54 cu in.
9	6x1¼x1¼	D120-J100B 7/16	215	0.370 cu in.
10	"	D120-N100B 7/16	215	0.3705 cu in.
11, 12	"	D120-R100B 7/16	215	0.36-0.37 cu in.
13, 14	20x3x12	D100-N100B 1/16	197	3.6-4.0 cu in.

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol O. C. Turbine Oil

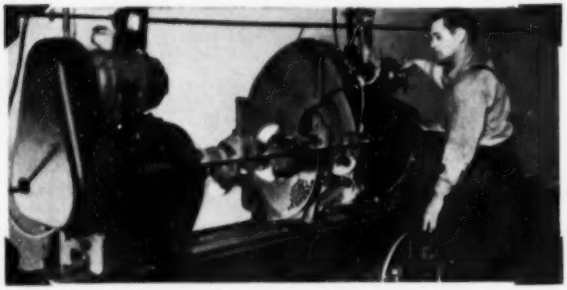
APPLICATION Hydraulic medium

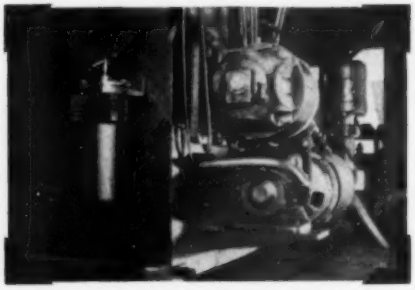
UNIT Control on hydraulic grinder Landis Type C – 36 in wheel

SERVICE Crankshaft and cylinder grinding.

FIRM Crankshaft Co, Los Angeles

Inhibited oil saves $1000 per year in "down time"!





CALOL O.C. TURBINE OIL–15 has operated the hydraulic feed on this heavy-duty grinder for 5 years without the formation of any sludge or corrosion in the system. With the oil used previously, it was necessary to make a complete system clean-up twice a year at a cost each time of about $500 in labor and work-hours lost. The filter and pump (right) are checked and cleaned every 6 months. Only leakage make-up was added during the five years to the original charge of Calol O.C. Turbine Oil.

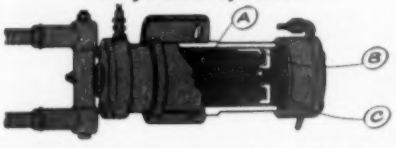
CRANKSHAFT CO., owned by Mr. A. W. Alexander (above), specializes in precision grinding, makes many of the shafts used by top racing drivers. Mr. Alexander says, "By keeping the feed control on my machine working smoothly, Calol O.C. Turbine Oil helps us to turn out finer work."

REMARKS: Calol O.C. Turbine Oil is valuable in many services where even minor oxidation or corrosion may cause trouble. It resists the action of both fresh and salt water. Calol O.C. Turbine Oil comes in several viscosity grades to meet all operating conditions.

CALOL

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

How Calol O.C. Turbine Oil cuts costs in hydraulic systems



Used as the hydraulic medium in feeds and lifts of any kind, Calol O.C. Turbine Oil will not form carbon or foam excessively.

A. Contains very effective oxidation inhibitor—will not deteriorate and plug lines and retard action of cylinders.

B. Corrosion inhibitor prevents rusting and pitting—has high metal-wetting ability.

C. Separates readily from water or other contaminants—dirty oil may be reclaimed easily...charge lasts indefinitely, leakage only cause for replacement.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

Screw-Thread Decarburization Limits

Bolts and capscrews purchased by the automotive and implement industries are purchased to specifications for material and minimum tensile strength. A carbon content throughout the threads which is equivalent to that of the core is desirable in most products.

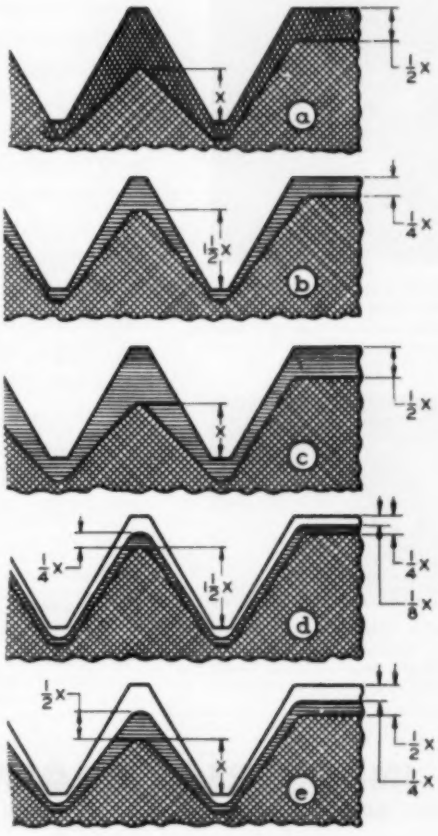
The accompanying diagrams show the various conditions that may be encountered with respect to surface and sub-surface carbon content. Classifications "a" to "e" are in descending order of quality. At "a" surface carbon content is equal to the core carbon content or may be slightly carburized.

To examine samples, the threaded part is sectioned longitudinally through the center and polished so that rounding of the thread edges is held to a minimum. After etching with nital, measurements are made from the root of the thread to the beginning of the decarburized zone (lighter color of sub-surface zone). Measurements are made with a metallurgical microscope with fixed-scale micrometer eyepiece or the image is thrown on the camera ground glass and measured with dividers and scale.

In the accompanying diagrams, X equals ½ basic thread depth.

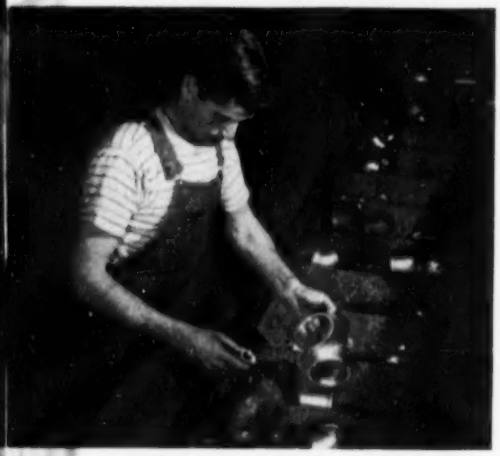
Note: Dimensioned zones shown on the shank indicate the approximate depth of bar decarburization that will produce the corresponding amount of thread decarburization when the threads are rolled. Dimensions at the shank are not part of this specification.

These data are used in the automotive industry

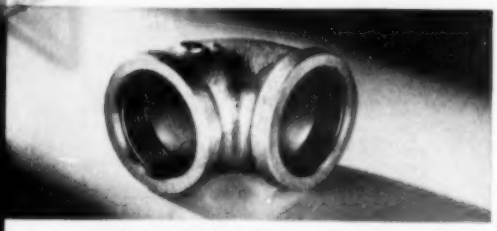


PITCH	X
28	.01160
24	.01353
20	.01624
18	.01804
16	.02029
14	.02319
13	.02498
12	.02706
11	.02952
10	.03247
9	.03608
8	.04059

A PIPE FITTING MANUFACTURER had trouble with a straight cutting oil. It made the floors slippery; was suspected of causing skin irritations; discolored the fittings. In addition, a special cleaner and rust preventive had to be used.



CHANGING TO S.E.C.O. brought excellent results. This "Job Proved" emulsifying cutting oil kept the fittings from discoloring, minimized complaints about skin troubles, made floors safe, eliminated the need for a special cleaner and rust preventive.



OPERATIONAL DATA. Machine: 2" automatic tapping machine • Metal: Malleable iron • Operation: Thread and chamfer 1½" 45° elbow • Cutting Speed: 75 SFM • Tools: High speed • Production: 306 pieces per hour • Cycle Time: 11¾ sec.

S.E.C.O. REPLACES THREE PRODUCTS; REDUCES COSTS, MAKES SHOP CLEANER, SAFER

Ten years ago, one of the largest manufacturers of pipe fittings was using a straight cutting oil that proved to be a production headache. It made floors slippery, discolored the fittings, even was blamed by the operators for causing skin ailments.

The company overcame these problems—with extra benefits for good measure—by changing to Sunoco Emulsifying Cutting Oil. S.E.C.O. performed as a quality cutting oil is expected to, and eliminated the need for two costly supplementary products: a special alkali cleaner and a rust preventive. Sprayed on the parts conveyed through the washers, S.E.C.O. left a film that gave complete protection against rusting. Oil costs were reduced to an amazing extent; floors were safe; complaints about skin irritations were minimized and shop morale improved. The pipe fittings, free of discoloration, commanded a better position saleswise. The company standardized on S.E.C.O. and has been using it ever since.

In all machine shop operations, on both ferrous and nonferrous metals, Sun Emulsifying Cutting Oil is definitely superior. That's why more S.E.C.O. is used than all other brands of emulsifying cutting oil combined. For more operational data on typical S.E.C.O. applications, write for a copy of the new "Cutting and Grinding Facts." Department **AM-11.**

SUN INDUSTRIAL PRODUCTS

SUN OIL COMPANY, PHILADELPHIA 3, PA. • SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

SUNOCO

Bolt-Steel Classification

PHYSICAL PROPERTIES FOR NINE CLASSIFICATIONS OF BOLTS

SAE Classification	Head Marking (Radial Lines)	Bolt Diameter (Inches)	Minimum Tensile Strength PSI	Proof Load PSI	Hardness		Also See Note
					Brinell	eRockwell	
Grade 0	NONE	——	——	——	——	——	
Grade 1	NONE	All	55,000	——	207 Max.	B 95 Max.	1
Grade 2	NONE	Up to 1/2 incl. Over 1/2 to 3/4 incl. Over 3/4	69,000 64,000 55,000	55,000 52,000 ——	241 Max. 241 Max. 207 Max.	B 100 Max. B 100 Max. B 95 Max.	2
Grade 3	(180°)	Up to 1/2 incl. Over 1/2 to 5/8 incl.	110,000 100,000	85,000 80,000	207 - 269 207 - 269	B 95 - 104 B 95 - 104	3
Grade 5	(120°)	Up to 3/4 incl. Over 3/4 to 1 incl. Over 1 to 1-1/2 incl.	120,000 110,000 105,000	85,000 78,000 74,000	241 - 285 223 - 285 223 - 285	C 23 - 30 C 19 - 30 C 19 - 30	4
Grade 6	(90°)	Up to 5/8 incl. Over 5/8 to 3/4 incl.	140,000 133,000	110,000 105,000	285 - 331 269 - 331	C 30 - 36 C 28 - 36	5
Grade 7	(72°)	All	150,000	105,000	269 - 321	C 28 - 34	6
Grade 8	(60°)	All	150,000	120,000	302 - 352	C 32 - 38	6
None	(90°)	All	55,000	40,000	143 Min.	B 79 Min.	7

Notes:

1. Commercial bolts, open hearth, electric furnace or Bessemer steels may be used.

2. Cold-headed or double-extruded, low-carbon steel bolts. Stress relieved at 875-925 F, or hot-forged bolts heat treated where necessary to meet requirements. Hot-forged bolts over ⅝ in. may be obtained under this grade number, but must be heat treated to obtain physical property requirement for the ½- to ¾-in.-size range.

3. Medium-carbon, cold-worked bolts, heat treated to relieve upsetting stresses.

4. Medium carbon, quench-tempered bolts, to which a minimum tempering temperature of 800 F has been applied.

5. Special medium-carbon, quench-tempered, high-strength bolts. Minimum tempering temperature is 800 F.

6. Fine-grain, medium carbon alloy, quench-tempered bolts. Minimum tempering temperature, 800 F. Minimum as-quenched hardness: up to ½ in.—Rockwell C47; over ½ in.—C45. Microstructure shall be free from ferrite.

7. Stainless steel with not less than 12% chromium. After finishing, bolts must be passivated by dichromate process. Such bolts should not be assembled unless coated with anti-seize compound.

This classification does not apply to parts welded in place or otherwise subjected to heat that alters the microstructure. No limitation has been placed on chemical compositions of steels for above bolt classes.

These data cover the requirements for bolts, cap-screws, studs and nuts used in the automotive and allied industries

STEELS THAT CAN BE PROCESSED FOR CLASSIFICATIONS 7 AND 8

Bolt Diameter (Inches)	Minimum As-Quenched Center Hardness Required	Min. Distance on J Bar where Min. Hardness is Required	SAE H Steels Applicable
1/4 & 5/16	RC 47	5/32	1335, 3135, 4047, 4132, 5135 8635, 9437
3/8 & 7/16	RC 47	3/16	1335, 3135, 4047, 4135, 5135 8635, 8735, 9437
1/2	RC 47	7/32	1340, 3135, 4053, 4135, 4640 5140, 8637, 8735, 9440
9/16	RC 45	4/16	1340, 3135, 4053, 4135, 5140 8635, 8735, 9440
5/8	RC 45	9/32	1340, 3135, 4055, 4135, 5140 8637, 8735, 9440
3/4	RC 45	5/16	1340, 3135, 4053, 4135, 5140 8637, 8735, 9442
7/8	RC 45	11/32	3140, 4135, 4640, 5145, 8640 8737, 9445
1	RC 45	6/16	3140, 4135, 5147, 8640, 8737 9445

Any steel having higher hardenability than one shown in any one of the above groups will also be applicable in that group.

Any of the above classifications will be satisfied with individual heats of steel with lower carbon than designated if that heat meets the hardenability requirement for the particular classification.

Production News

ABOUT *Lusol*.. —THE ALL-CHEMICAL METAL-WORKING SOLUTION

FROM F. E. ANDERSON OIL COMPANY · PORTLAND, CONNECTICUT

"I've never seen anything that works like Lusol!"

The foreman in one of Ohio's finest machine and tool plants pointed out machine after machine "working better with Lusol". "We change this form tool every twenty-four hours, whether it needs it or not," said the day man on a lathe. "Used to make three strokes on a deep drilling operation; do it in one with Lusol," said another.

"Grinding wheels require less dressing, finishes are finer—thread chasing and tapping go fast, without tearing—no dermatitis, no odors, no rusting;" with reports like these all through the shop, no wonder they've practically standardized on Lusol for machining and grinding.

"Look how clean these threads are, and our chasers and taps last a lot longer with Lusol".

★

Stamping with Lusol

This is one of the newer uses for Lusol. Its high film strength gives it lubricating properties under extreme pressure . . . safeguards both the tools and the products while decreasing down time for die maintenance.

Since Lusol contains no oil, parts come off the presses clean, without foreign particles clinging to them. Handling and finishing is easier and less costly. There's no smoking to make surroundings disagreeable. Work and dies run cool.

users say*

case histories of Lusol at work

A GEAR MAKER—Never got more than 4 pieces per hob tooth with the old coolant. Put a 20:1 Lusol solution in our gear hobbers, and now we get as high as 22 pieces per hob tooth.

UNIONS COMPLAINED at too much smoke in a machine shop; insisted on new, powerful exhaust fans which would have required a greatly expanded heating system. Because there's no smoking when you're cutting with Lusol, that was the solution offered.

A PLANT SUPERINTENDENT —"Where have you been for the last two years?" exclaimed this man, when he saw how drilling operations and turning on their Warner & Swasey lathes had been speeded up with Lusol.

A TOOLMAKER—"I haven't found anything that works as well as Lusol on thread chasing and tapping high carbon steels."

*Users' names furnished on request.

FREE BOOK

Get complete facts about Lusol by writing for this 20-page booklet. It contains information on machine cleaning, maintenance of Lusol solutions, elimination of dermatitis and odor in machines, plus many case histories of Lusol at work. Write F. E. Anderson Oil Company, 215D, Portland, Conn.

TALKING SHOP

Realistic First Aid

U S STEEL, under Dr W K Riland, is providing a very realistic first-aid training. After usual instruction in rudiments, students are sent into a darkened room with a flashlight. There is a simulated serious injury: a student with sheep's stomach and intestines seemingly protruding from his abdomen; or one covered with raw hamburger and dried turkey skin on his back, like a serious burn. Only a few chicken-hearted trainees were found. US steel has an extensive defense training program, of which this is a part. . . According to latest information, heavy gloves, shoes and ordinary heavy clothes are best against residual radiation—no special "atomic clothes" are necessary. . . Light skin is safer in atomic attack. Fair skin absorbs only 60% of flash radiant heat, dark skin 90%.

Edge Breaker

ANOTHER WAY to conserve diamonds is to replace a diamond stick with a toolbit or scrap of the hardest grade of tungsten carbide, says Bob Meyer of Lees-Bradner. The hard carbide can be used to "break" or chamfer the edges of newly ground carbide bits and does a better job than the diamond stick because it is less abrasive.

Foreign Obsolescence

AVERAGE AGE of equipment in some Belgian plants is about five years; the average is 10 to 20 years—far below our American averages. In Switzerland, where no war damage occurred, average age is 10 to 20 years. Other European countries have similar figures, a result of more liberal depreciation policies on the part of national governments . . . Along the same line, Belgium has a tariff of only 6% on machine tools, compared with 15 to 20% in the US. Belgium exports three-quarters of its machine tools, averaging about $2½ million to the US during each of the years '48 to '50. In '51, totals of the last half year were as high as the previous annual average . . . Swiss machine-tool exports to the US were only a fifth (one year a seventh) of their machine-tool imports from the US in the years after World War II, until last year.

Carbides Plunge-Ground

PLUNGE-CUT GRINDING of carbide with diamond wheels is advocated by Jan Taeyaerts, pres., Precision Diamond Tool Co., Elgin, Ill., based on his observations in Switzerland and three years of use in this country. Method, as compared to light-cut, fast-pass procedure usually followed, is faster, produces less shock and abrasion on diamond. Bond stands up better, corners of wheel stay sharp, wheel dressing is minimized. However, abundant coolant must be used. For grinding chip breaker 1 in. long, operator sets wheel to depth, say 0.010 in., and grinds in 10 sec. Manual feed is used up to point where wheel begins to labor. Milling cutters can be sharpened in half the time of the conventional method, it is said.

Cards

C A NORGREN Co has added two services to the expected ones. Flowers are sent to female employees and to wives of employees on their birthdays, and male employees get greeting cards on their birthdays. All new babies of employees also receive gifts.

Waves

NAVY RESEARCH SCIENTISTS have discovered that solidification of a casting occurs inward from the mold walls in waves, wave shape and movement depending on the thickness and material of the walls. As a consequence, they've developed proper design considerations for molds.

Little Red Riding Hood

THAT FABLED CHARACTER, Little Red Riding Hood, becomes the heroine of the 1951 Annual Report to Employees of Thompson Products, Inc, Cleveland. Our heroine, as the "Thompson Dollar," is pursued, as always, by a wolf—in this case, "Rising Costs." In a 9x12-in., 12-page multi-color cartoon folder, the company shows graphically how a take of $197 million, biggest in company history and an increase of $73 million over 1950, was used. But materials and supplies took $87 million, taxes $17 million (up 50% in a year), depreciation $2 million, and other expenses $7.6 million. Of the $83 million left, employees got 90.8%, or $75.6 million (up 58% over 1950), $5 million (6%) went back into the business, and $2.6 million (3.2%) was paid out as dividends. Thus employees got more than 28 times as much as stockholders, taxes took six times as much as dividends (over $900 per employee)—more than $2 out of every $3 of profit. Profit thus was below that of 1950, on a much larger volume. Poor Red Riding Hood ends up with only her basket.

News of Metalworking

Metalworking Firms Bought

• **American Machine & Foundry Co.**, New York, has purchased Thompson-Bremmer Co., Chicago, manufacturer of industrial fasteners and electrical terminals. AMF recently signed an option to acquire all assets of Leland Electric Co., Dayton, Ohio.

• **Barber-Colman Co.**, Rockford, Ill., will purchase Wheelco Instruments Co., Chicago. Operations will continue for a time at Chicago, later transferring to Rockford.

• **Ferro Corp.**, Cleveland, has acquired a 50% interest in the Wel-Met Co., powder-metallurgy firm, at Kent, Ohio and Salem, Ind.

• **Mueller Brass Co.**, Port Huron, Mich., has purchased Valley Metal Products Co., Plainwell, Mich.

• **Arwood Precision Casting Corp.**, Brooklyn, N. Y., has purchased Metalmold Corp., Derby, Conn.

• **Elastic Stop Nut Corp. of America**, Union, N. J., has merged with American Gas Accumulator Co., Elizabeth, N. J., the latter firm to be operated as a division of Elastic with present AGA management.

• **Rockwell Mfg. Co.**, Pittsburgh, has acquired Deluxe Saw & Tool Co. and Karbide King Toll Corp., bringing the number of subsidiaries and divisions of Rockwell to 19.

Bigger Allocations of Steel, Copper, Aluminum to Benefit Small Users

WASHINGTON—Substantially 100% of materials required by many of the small users will be obtainable in the third quarter, Defense Production Administration declared in announcing new allocations of steel, copper, and aluminum.

The increased allocations will benefit particularly the small producers of civilian-type products, many of whom have suffered severe hardships because of inability to obtain scarce materials.

• **In consumer goods fields**, DPA increased aluminum allocations about 37% over the second quarter, copper products by 19%, and steel by about 15%.

The increase in materials could be temporary. NPA Administrator Manly Fleischmann indicated that "a slight tightening of demand could easily" cut the allocations.

The defense program still will take a substantial part of the third quarter supply of controlled materials—about 46% in the case of copper brass mill products. About 43% of all aluminum produced, 27% of copper wire mill products, 19% of copper foundry products, 18% of the carbon steel supply and about 35% of the alloy steel supply will go for defense in the third quarter.

• **Total allotment of copper** products, including materials held in reserve by DPA and NPA, exceeds total second quarter allotments by about 2%, steel allotments are about 3% higher, and aluminum about 7%.

Higher third quarter allocations result, in part, from an increase in over-allotments to insure that all mill production is taken up. For the third quarter, allotments of carbon steel exceeded supply by 17%; copper brass mill products, 16%; wire products, 10%; copper foundry products, 23%; and aluminum 13%.

(See table for breakdown of materials alloted to NPA divisions.)

NATIONAL PRODUCTION AUTHORITY DIVISIONS	Revised 2nd Qtr. STEEL (tons)	3rd Qtr. STEEL (tons)	Revised 2nd Qtr. COPPER (000 lbs.)	3rd Qtr. COPPER (000 lbs.)	Revised 2nd Qtr. ALUMINUM (000 lbs.)	3rd Qtr. ALUMINUM (000 lbs.)
Agr. Mach. & Impl. Div.	372,160	349,260	8,686	8,850	8,389	9,400
Aircraft Div.	17,716	20,240	1,696	1,780	8,476	10,200
Aluminum & Magnesium Div.	—0—	—0—	—0—	—0—	6,223	4,300
Building Materials Div.	878,329	903,600	49,458	57,945	48,250	68,000
Canadian Div.	479,488	506,500	3,911	3,335	1,843	1,900
Chemical Div.	133	260	962	991	3,643	4,750
Communications Div.	43,159	41,775	47,123	52,720	3,014	4,000
Construction Machinery Div.	514,541	564,025	7,093	7,785	1,999	2,300
Consumer Durable Goods Div.	828,196	953,269	38,713	46,044	56,563	77,671
Containers & Packaging Div.	1,597,061	1,540,150	554	600	23,330	24,000
Copper Div.	38,027	38,600	3,593	3,700	1,725	1,500
Electrical Equipment Div.	583,047	594,650	158,770	168,200	29,831	34,000
Electronics Div.	61,888	63,525	30,639	31,500	12,082	12,900
Engine & Turbine Div.	857,163	883,000	29,695	31,823	2,082	3,435
Facilities Bureau						
Construction Controls	80,279	90,070	1,130	1,970	—0—	—0—
Industrial Expansion	671,342	529,500	32,399	45,970	12,791	9,000
General Components Div.	1,178,995	1,161,750	179,665	183,110	20,491	22,000
General Ind. Equip. Div.	544,295	568,000	42,426	45,950	18,196	19,000
Iron & Steel Div.	210,004	160,150	4,282	4,161	116	110
Leather & Leather Prod. Div.	7,842	9,650	1,664	1,664	581	600
Lumber & Wood Prod. Div.	6,062	6,008	131	160	820	1,050
Metalworking Mach. & Equip.	817,628	861,250	28,780	29,900	7,749	9,950
Mining Mach. & Equip. Div.	136,255	135,420	3,377	3,555	250	260
Misc. Metals & Minerals Div.	3,589	3,540	2,478	2,450	114	160
Motion Pic. Photo Prod. Div.	7,516	6,219	1,963	1,162	2,713	2,900
Motor Vehicle Div.	3,041,125	3,294,450	110,075	120,830	62,997	65,625
Ordnance & Shipbuilding Div.	104,904	124,975	11,390	11,175	1,408	1,500
Printing & Publishing Div.	4,717	5,520	1,052	1,160	463	640
Pulp, Paper & Paperboard Div.	998	950	50	65	28	100
Railroad Equip. Div.	1,755,176	1,773,373	85,359	85,950	3,945	4,970
Rubber Div.	27,264	28,338	3,579	3,610	392	950
Scientific & Tech. Equip. Div.	41,125	51,740	40,524	41,700	12,587	13,600
Service Equip. Div.	38,497	40,460	2,551	2,685	3,353	3,720
Water Resources	216,415	230,089	3,031	2,800	318	200
NPA—(Ex. Reserves) TOTAL	14,724,624	15,190,191	934,594	994,500	367,970	414,491

50% Increase in

LOUISVILLE, Ky.—Major appliance industry sales billed probably will approximate $4.5 billion by 1960 if the percentage trend of disposable income spent for major appliances keeps pace with that of the past few years, predicted C. H. Linder, general manager, Major Appliance Div., General Electric Co., who spoke here March 20 at a suppliers conference and product parts exhibit. He reported that major appliance industry sales billed in 1951 approximated $3 billion.

General Electric expects to spend $50 million more for materials and parts for its major appliance manufacturing in 1960 than it did last year, Mr. Linder said.

The GE Appliance head reviewed industry estimates for some specific appliances, comparing saturation percentages for 1951 with those estimated for 1960 and appliance unit production in 1951 with estimates for 1960. He explained that by "saturation percentage" he meant the proportion of potential customers who already have the appliance. The estimates follow:

• **Refrigerators**—At end of 1950 the market was 86.4% saturated. A saturation of 95% will be reached by 1961, it is estimated. Refrigerator sales in 1951 totaled 3.9 million units. Industry sales annually of household refrigerators are expected to remain at about present levels. Sales for the most part will be replacements.

Permanent Machine-Tool Reserve Plan Held Essential to Security

BUFFALO—Recognition by the federal government of the vital importance of the machine-tool industry as the basic foundation of national defense is the nation's most urgent need in long-term defense planning, Frederick S. Blackall, jr., president, National Machine Tool Builders' Association and president, Taft-Peirce Mfg. Co., declared at the Westinghouse Machine Tool Electrification Forum at the Statler Hotel April 1 2.

Mr. Blackall said that "establishment of some sort of a permanently operating national machine-tool reserve program is essential to our security." But he cautioned that the reserve must be kept up-to-date and the surplus periodically discarded without "foisting unused but obsolete machine tools upon American industry." He further advocated a stand-by plan of priorities to provide money, men, materials and manufacturing which could be put to work by executive order on a moment's notice in emergency.

• **In its tax policy** Washington must recoginze the special problems and special needs of highly cyclical industries, Mr. Blackall said. The government must face the fact that the basic difference between prosperity and depression lies in the welfare of the durable goods producer. Tax laws on depreciation allowances should be drawn to stimulate rather than discourage constant modernization of our industrial plant.

• **Machine-tool shipments** will rise the next few months until an average of $100 million a month is attained, Tell Berna, general manager National Machine Tool Builders' Association, predicted. That production level should be maintained until sometime in 1954. Shipments in February were $81.6 million, excluding presses.

This high level of activity does not hold throughout the machine-tool industry, Mr. Berna said. Some plants are making machines not so badly needed for defense; for them, denial of the right to ship unrated orders represents a real hardship.

Mr. Berna said that foreign machine-tool builders are permitted to deliver machines here without restriction. Their plants are being built up while U.S. makers are unable to compete in an open market. He pointed out that in normal times U.S. companies sell 25% of their output abroad and that now they must maintain their dealer organizations overseas against the day when export orders will be highly essential. Only recourse of U.S. builders is to offer domestic and foreign customers machines so much better in design and productive ability that users cannot afford not to buy them.

• **Eight papers** and several forum discussions were included in the technical portion of the machine-tool electrification forum.

A paper on numerical control of machine tools, by Professor W. M. Pease of Massachusetts Institute of Technology, described work which has been done in the MIT electrical laboratories on the control of a Cincinnati Hydrotel milling machine with punched tape which transfers information directly to machine elements without attention from an operator.

Work on this development has been proceeding for the past two years and is showing promising results.

General chairman of the forum was J. J. Smith, Jr., Industrial Dept., Westinghouse Electric Corp.

Major Appliance Sales Predicted By 1960

• **Automatic washers**—1951 saturation 12.8%, estimated 1960 saturation 39%; 1951 sales 1.55-million units, estimated 1960 sales 2.6-million units.

• **Automatic clothes dryers** — 1951 saturation 1.1%, estimated 1960 saturation 16.9%; 1951 sales 350,000 units; estimated 1960 sales 1.2-million units.

• **Electric ranges** — 1951 saturation 21%, estimated 1960 saturation 43%; 1951 sales 1.4-million units, estimated 1960 sales 2.2-million units.

• **Electric water heaters**—1951 saturation 11.6%, estimated 1960 saturation 24%; 1951 sales 845,000 units, estimated 1960 sales 1.8-million units.

• **Food freezers** — 1951 saturation 5.8%, estimated 1960 saturation 24.6%; 1951 sales 1-million units, estimated 1960 sales 1-million units.

• **Dishwashers**—1951 saturation 2%, estimated 1960 saturation 12%; 1951 sales 260,000 units, estimated 1960 sales 1-million units.

• **Garbage disposers** — 1951 saturation 2.1%, estimated 1960 saturation 15%; 1951 sales 335,000 units, estimated 1960 sales 1.25-million units.

Initial production of appliances at Louisville is expected to begin late this year, Mr. Linder revealed. First appliances scheduled: electric dishwashers, room coolers, and automatic clothes washers and dryers. Production of ranges is scheduled for next year.

Original plans called for production of jet-engine parts for the Air Force in the first building at GE's Appliance Park here. But the change of Air Force requirements, resulting in cancellation of GE's production contract, released this building for major appliance manufacture.

Total attendance at the suppliers conference approximated 900, including about 700 suppliers, business and civic leaders from the Louisville area, and General Electric personnel.

INDUSTRIAL NOTES

• **Clinton Machine Co.** is selling out its assets at Clinton, Mich. Cutting of costs by consolidation was one of the chief reasons given. Two other divisions of Clinton Machine Co. in Detroit and Maquoketa, Ia., will continue operations.

• **Ryan Aeronautical Co.** and California Metal Enameling Co., San Diego, have merged their activities in the field of production and testing of ceramic-coated parts for high-temperature aircraft applications.

• **Ravenna Arsenal Inc.**, a subsidiary of Firestone Tire & Rubber Co., has taken over all operations of the government's Ravenna Arsenal at Ravenna, Ohio.

• **Hamilton Div. of Clearing Machine Corp., Hamilton, Ohio,** has begun production of a new line of heavy-duty double housing planers.

THE BULLARD STORY

Management Reveals Unusual Measures Taken to Meet Defense Requirements

WASHINGTON—Steps taken by The Bullard Co. to increase output of machine tools for defense production were detailed here April 1 in testimony before the Mobilization & Procurement Subcommittee of the Senate Small Business Committee.

Frank U. Hayes, Bullard vice president and sales manager, revealed that since the outbreak of war in Korea, Bullard has increased its production rate four times that of 1950, expanded output of single-spindle vertical turret lathes from 15 units a month to 78 units, and has received $1.5 million of work from 60 subcontractors, with $4 million outstanding in commitments.

• **Reviewing operations** between June 1950 and March 1952, Mr. Hayes said that Bullard received its first defense orders, for machines for manufacture of tank transmissions, eight weeks after Korea, and action was taken immediately to increase production.

Additional orders came in September 1950 from Army Ordnance contractors, and first orders were received from aircraft engine contractors. Also, in October of that year, Bullard got a large order from the British Ministry of Supply.

• **To enlarge production** Bullard's commitments for capital equipment have totaled $1.5 million, Mr. Hayes reported. One-third was received by end of 1950. During 1951 an additional $785,000 was received, and currently $260,000 is yet to be delivered.

Total output in 1950, aided by subcontracting, was 2½ times the 1950 volume, Mr. Hayes reported.

Realizing that still greater production was necessary, Bullard decided to streamline production in January, 1951 by discontinuing manufacture of certain non-critical machines.

Late in 1950 Bullard set up a Subcontracting Division, which turned up, as its first task, 18 foundries to supplement the supply of castings from Bullard's own foundry.

Bullard furnished these foundries with patterns and flask equipment. It also located outside sources for machining parts and subassemblies to supplement Bullard's capacity.

"From this it readily can be seen why price relief to include subcontracting cost was so necessary to the machine-tool industry in the early months of 1951, and certainly justified the issuance of revised ceiling price controls which included allowance for subcontract cost," Mr. Hayes explained.

At the Air Force's request, Bullard submitted on January 15, 1951 a proposal totaling $7 million for additional buildings and facilities to increase the then planned production rate of 30 single-spindle units per month to 60 per month. Air Force said that its funds couldn't be used for this purpose. Instead, the Air Force suggested that Bullard screen the list of AF machine-tool reserves. The files turned up 68 machine-tool items, 64 of them usable. These are now in operation.

Twelve more machine tools were obtained from Corps of Engineers.

It soon was apparent, however, that still more machine tools were required. Not until November 1951 did Bullard receive a letter of intent from General Services Administration covering 28 needed machines valued at $1,650,000. By March 15, 1952, only half of these had been received.

• **There were contract difficulties,** too. Mr. Hayes cited, as one example, an Air Force request of January 1951 for submission of a proposal to cover 519 machine tools, all of the single-spindle type, but of different sizes and specification. A contract was eventually approved by the Air Force on December 1951, almost a year later.

The time lapse didn't affect progress of work under the order, Mr. Hayes said. The trouble came later. In the letter of intent the Air Force originally listed the machines and specifications in detail. Allocations then were made to various engine contractors who were to use the machines. However, the allocations were repeatedly changed and in some instances varied from the order, apparently due to changes in engine schedule.

"The situation soon became and remained so confused that it was virtually impossible to schedule the

War Potential No Stronger Than Machine-Tool Industry

WASHINGTON—Economy of the United States in peacetime will depend "in a large measure on the health and vigor of the machine-tool industry, and our war potential in time of emergency will be no stronger than the machine-tool industry" declared Richard E. LeBlond, president, R. K. LeBlond Machine Tool Co., Cincinnati, in testimony before the Senate subcommittee on Mobilization & Procurement.

That health and vigor would not be encouraged, Mr. LeBlond indicated, if the industry is to be faced with these problems: (1) machines built on government account being purchased by the industry's regular customers from the government at a fraction of their cost or replacement price; (2) another period of descending volume; (3) another period like 1946-1949 when the production facilities of 22 plants in the industry were lost to the country; and (4) some of the market being taken up by government-owned machines and another segment of the home market being taken up by machine tools made in foreign countries, by labor paid a fraction of that paid here.

• **A current machine-tool backlog** of $28,395,339 was reported by Mr. LeBlond, with another $4 million in process of negotiation.

Subcontracting is expected to amount to $2 million by the end of the year, on the basis of $259,200 for the first two months this year.

machines for processing and manufacture in our plant," Mr. Hayes stated. So the Air Force terminated the contract, at the same time authorizing its contractors to purchase the machines they needed directly from Bullard. That eliminated a lot of administrative problems.

Mr. Hayes explained in detail the Bullard-Fisher Body contract, now terminated. As a subcontractor, Fisher Body was to build 757 Bullard 42-in. Cut Master vertical turret lathes. Mr. Hayes emphasized that decisions to let and to terminate the contract were government decisions.

• **There were two phases** to the Bullard-Fisher Body matter. The first, extending from January to July 1951, considered the possibility of Fisher Body producing the machines. Nothing came of it. The second phase began in August 1951 when NPA reopened the matter, leading to issuance by GSA in September 1951 of a letter of intent, eventually terminated in February 1952.

Air Force originally asked for 1000 Bullards. Later the number was reduced to 757. "We were surprised," Mr. Hayes stated, "that such a large quantity of one specific size and type of machine tool of our manufacture was needed without corresponding demand for other sizes and types." But the Air Force told Bullard that the need for these machines had been proved.

The second phase was reopened still on the basis of 757 42-in. Cut Masters. Buick was stated to require approximately 400 of them to build Sapphire jet engines.

"We said we would be glad to cooperate in whatever NPA wished us to do," Mr. Hayes said, "but did point out that we had no desire to see a quantity of our machines produced by another source at a relatively high cost, merely to go into government storage and to be sold later as surplus at depressed prices to our detriment."

• **Price submitted to Bullard** by Fisher Body for manufacture of the 757 42-in. machines, without electrical equipment, was **$75,304 each.** Bullard's price for the same machine was approximately $38,000. But price was no obstacle, the government told Bullard, because the machines were so critically required. On September 12, 1951, a pool order was placed with Bullard with the understanding that the machines would be subcontracted to Fisher.

Bullard's proposal to NPA stated: "It is further understood that in requesting this proposal you have given due consideration to the difference in cost to the government of such an arrangement as compared to current ceiling price for like machines manufactured by us."

The proposal quoted a price of $90,608 per machine, $75,304 representing the cost to Bullard of a Fisher-produced machine. The $15,304 difference "by no means represented profit to us," Mr. Hayes stated. (See table.)

Bullard then undertook to sell the machines through its usual field organization, as required by GSA.

• **Then came the surprise.** Bullard salesmen called on Buick as a large potential user of the machines. They were told that none would be required, Buick's needs being covered by allocations of Bullard machines being procured by the Air Force under a previous contract.

Buick's explanation: It had had to revise its planning and process the jet engine components parts with different types of equipment because of the time it had taken to get Fisher into production. Also, the monthly production schedule for the Sapphire engine had been substantially reduced. Bullard then approached other AF contractors, with negative results. This was reported to NPA.

Result: On January 23, 1952, operation of the Fisher subcontract was suspended by extending the letter of intent until February 6, 1952. On that date the letter of intent was formally terminated. At that time none of the machines had been completed and Bullard did not have a firm order for any of them.

Bullard Costs on Fisher Body Contract

Estimated cost for time and expense of Bullard personnel at Fisher plant and added engineering and supervisory work at Bullard plant on this subcontract	$ 400.00
Main drive motor and starter	946.00
Estimated selling and installation expense (entire responsibility for selling the machines was ours)	1,203.72
Parts to be furnished to Fisher at no charge by Bullard	182.54
General Administration expense	803.81
Estimate reserve for service and guarantee	400.00
Estimated reserve for dealer discounts on sales in territories serviced by our established dealers	2,009.52
Engineering and pre-production expense	440.00
Estimate profit before renegotiation and taxes	8,918.41
	$ 15,304.00

Optional Rate of Write-Off Urged for Equipment

WASHINGTON — Charging that present Internal Revenue Bureau Regulation TD-4422, requiring machine-tool write-offs to be spread over 20 to 25 years, is strangling modernization, perpetuating obsolescence, and consuming the industrial might of America, L. D. McDonald, executive vice president, Warner & Swasey Co., recommended to the Subcommittee on Mobilization and Procurement of the Senate Small Business Committee an amendment to the Internal Revenue Code providing that the rate of write-off of capital invested in productive equipment be optional with the individual manufacturer.

Section TD-4422, Mr. McDonald said in his statement to the Subcommittee, operates consistently to restrain manufacturers from purchasing new equipment because it extends the period of recovery of capital far beyound the reasonably foreseeable future. He proposed that after a date to be fixed by Congress the manufacturer buying a new machine tool should be permitted to write it off in two years, five years, ten years, or twenty, as he chose, in the light of circumstances of his own particular company.

• **Optional rate of write-off,** Mr. McDonald said, would not only reverse the creeping obsolescence which threatens our productivity and encourage the modernization required to implement our defense program; it would solve the cyclical dilemma of the machine-tool industry.

SCRAP-DRIVE NOTES

NEW SALVAGE POLICY—Pratt & Whitney Aircraft has a new policy of steel salvage that resulted in feeding back into industry's bloodstream 17.6 million lb of steel during 1951. Under the program, the dealer receiving scrap containing aluminum, high alloy steels, and copper is directed to return that scrap specifically to P&WA's material sources, according to a ratio based on the percentage of metal products of that kind purchased from each of the company's different suppliers.

29 MILES OF SCRAP—More than 153,000 gross tons of vital iron and steel scrap—enough to fill 3400 gondola-type railroad cars stretching 29 miles—were collected and shipped to steel mills and foundries throughout the U.S. by the General Electric Co. during 1951.

WORN-OUT TOOLS AID DRIVE—During six months of a special drive, American Can Co. has collected nearly 4 million lb of iron and steel scrap salvaged from worn-out and obsolete equipment. The salvaged scrap collected in the firm's 50 odd can factories and can manufacturing equipment shops does not include scrap metal normally accumulated from the can-making plants and disposed of from month to month.

NEW OFFICES OPENED

• **Niagara Machine & Tool Works,** Buffalo, N. Y., has opened a Philadelphia district sales office at 50 East Wynnewood Road, Wynnewood, Pa.

• **Pratt & Whitney Div., Niles-Bement-Pond Co.,** West Hartford, Conn., has relocated its Pittsburgh office in a new building at 683 Lincoln Ave.

• **Yoder Co., Cleveland,** has opened an office at 11 W. 42 St., New York.

• **Minnesota Mining & Mfg. Co.** has opened a new Boston branch sales office and warehouse at 1330 Centre St., Newton Center.

• **Reliance Electric & Engrg. Co.** has moved its Detroit sales office to to 12326 Hamilton Ave., and its Cleveland office to 13967 Cedar Road.

Germans Enjoy Machine-Tool Boom,

FRANKFURT (McGraw-Hill World News)—German machine-tool makers no longer have to worry about orders.

Although handicapped by shortage of raw materials, skilled labor and investment capital, the German machine-tool industry in 1951 continued its aggressive comeback and today faces the future with guarded optimism.

• **Order backlogs** amounting to 12-18 months production are reported by most firms. Regular export orders are coming in a steady flow; old customers have returned to the fold and new ones are being added every month. American and British rearmament has added tremendous impetus to the point, actually, where some machine-tool builders wonder how to handle defense orders and keep their regular customers satisfied at the same time.

In 1951 Britain bought 1993 machine tools in Germany, worth approximately $6.5 million. Projected British purchases of German machine tools in 1952 are estimated at $28 million.

• **Special inducements** are offered by the German government to German machine-tool builders to get orders in the U.S. and other foreign markets. By registering a U.S. sale with a government agency, the builder receives priority on iron and steel deliveries equal to 10% of the value of the exported machine. Only 5% credit is extended on orders to other foreign countries, such as Brazil.

If weight of the exported machine is out of all proportion to its monetary value, the builder can elect to take an export "bonus" of DM 130 per ton, instead of the iron and steel priority.

German builders are making a concerted drive to secure agents and distributors in the U.S. They are encouraged to exhibit their products here, and the German government will reimburse them for 40% of promotion cost.

On the domestic side, the industry faces a tremendous challenge. German industry generally still suffers from a dearth of modern machine tools. Western defense and rearmament have recently served to emphasize the sad state of antiquity existing in many German plants.

Generally speaking, however, the Germans have been "poor customers" in their purchases of American machine tools. From April 1948 to June 1951, European countries, including England, imported a cumulative total of $97-million worth of machine tools. Of this total, Italy received machine tools in the value of $26 million, France $25 million, United Kingdom $17 million. Germany, during this period, received machine tools from the U.S. valued at $4.5 million.

• **East-West** tensions and subsequent trade restrictions are mirrored by the fact that exports of German machine tools to Czechoslovakia, Hungary and Yugoslavia dropped considerably in 1951. No overt shipments to Russia were recorded during the year.

In 1949 the Germans were actively seeking foreign business, and trade with Red nations looked attractive.

Germans Export Half of Machine-Tool Output

	1950		1951	
Production:	DM 368 million	80,300 tons	DM 661 million	126,000 tons
Export:	DM 167 million	34,606 tons	DM 300 million	69,976 tons

($1.00 = DM 4.20)

Large Volume Precision Tools* Also Exported

	1950		1951	
Production:	DM 135 million	10,472 tons	DM 144 million	— tons
Export:	DM 24 million	1,413 tons	DM 64 million	3,229 tons

*(Includes twist drills, cutters, hobs, reamers & countersinks, broaching tools, taps & dies, metal circular saws & slot cutters, gages & measuring tools, ordinary measuring instruments, chucks & other clamping tools, fixtures, cutting & punching dies of all types, including molds for plastics, and hard metal-tipped cutting tools.)

Spurred by Western Rearmament

This is no longer the case; the Germans have all the domestic and foreign business they can handle. Thus, smuggling has virtually ceased. At times, probably, small spare parts are taken over the Iron Curtain but generally the Germans have put a completely effective clamp on exports to the East.

The coal and power supply is a bottleneck for some firms. As German industry continues to expand and the defense programs gather speed, power shortages could turn into a major problem. But if, present plans for drastic increases in German coal production are realized, coal should cease to be a major probem in another 18 months.

• **In basic design** and quality, the Germans have caught up with the outside world. During the war in the first postwar years, no new designs appeared; but the last 18-2 months have seen radical improvement.

Only in the automotive field do the Germans depend primarily on American-made machine tools. Fiat of Italy and Renault of France were re-equipped with American machine tools, with ECA help. To meet this situation on a competitive and economical basis, the Germans feel they must have U.S. machine tools in their automotive industry. Daimler-Benz AG, Stuttgart, told AMERICAN MACHINIST with considerable pride that "our shops are equipped with the most modern American machine tools on the market."

• **A very serious shortage** still exists in skilled labor and supervisory personnel. A German plant manager looking for a qualified engineer faces two uncomfortable alternatives: he can hire a relatively old man with pre-war experience, who is not "up" on modern techniques and developments; or he can hire a very young graduate engineer without adequate technical experience and practical know-how. The "in-between" generation was wiped out by the war and the years immediately preceding and following the war.

The labor force in the industry grew from 40,050 men in 1950 to 48,000 by March 1951 and is now estimated at slightly above 50,000. It will increase as more apprentices and engineers are trained.

The German machine-tool industry is running close to the limits of its capacity and will be forced to remain on the present two-shift operational basis until present bottlenecks in power, fuel, materials and skilled labor are eliminated.

Exports and domestic commitments will suffer if German industry is charged in the coming months with the task of putting industrial muscle on the skeleton of European defense.

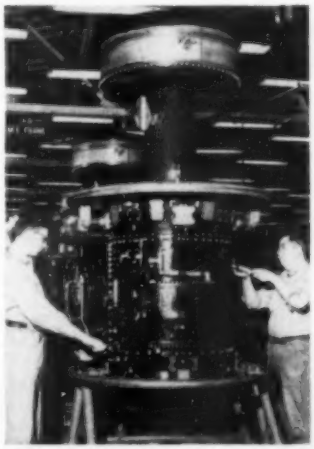
Britain is Germany's Best Machine-Tool Customer

	(Value in 1000 DM)	
Export to:	1950	1951
U. K.	3,719	47,410
France	10,017	23,459
Belgium	7,820	11,579
Holland	15,379	23,359
Denmark	4,089	6,459
Sweden	14,394	29,807
Italy	9,729	17,288
Switzerland	10,151	22,868
Austria	4,084	7,914
Czechoslovakia	9,008	4,676
Hungary	11,135	2,309
Yugoslavia	5,000	4,906
USA	1,439	13,434
Mexico	457	1,893
Brazil	4,559	20,010
Argentina	1,380	2,039

Industry Locates Out With the Cows

WASHINGTON — Industry locates the bulk of its new plants away from cities, in smaller places or open country. That fact stands out in a study of industrial construction awards made by a government agency.

More than half of the million-dollar industrial jobs initiated during the 18 months ending Dec. 31, 1951, are located beyond the metropolitan areas surrounding cities of 200,000 or more. Only one-sixth of the new industrial projects went into the cities themselves. Almost twice as many were located in the metropolitan areas—embracing hundreds of thousands of square miles—outside the city limits.



Engines produced at the Lockland jet center are almost completely assembled in a vertical position during initial build-up and are tipped to a horizontal position only to receive the tail cone and accessories which go into the nose section

Only private industrial projects with an estimated construction cost of $1 million or more were included in the study. No government works, utility projects or commercial buildings were included in the study.

• **In all, new facilities** or additions were undertaken for 446 plants during the 18 months following Korea. Estimated construction cost, exclusive of plant production equipment, totals nearly $3.2 billion.

On a basis of cities of 200,000 or more, 55% of the new plants or additions went to places outside the metropolitan areas of these cities. Another 29% went to locations inside the metropolitan areas but outside the cities. Many of the latter plants are in small places or on open land.

• **Little industrial construction** is going into smaller cities of the next size bracket — 100,000 to 200,000 population. Private industry put only 33 projects, or 7% of the total, into cities of this size — beyond the metropolitan areas of the bigger places.

On a cost basis, there is a striking disparity between big-city projects and other projects. Only 9% of the construction expenditure was slated for cities of 200,000 or more, as compared with 16% of the projects. Expenditures for the surrounding metropolitan areas of these cities, by contrast would show the largest average construction cost per plant. The dollar total for this bracket, however, includes one construction cost figure of more than $300 million for a single plant.

Robert C. Becherer

Edwin M. Miller

Fred W. Richardson

Charles W. Lee

Names in the News

Robert C. Becherer has been elected president and a director, Link-Belt Co., Chicago. As president, he succeeds **George P. Torrence,** retired. Also elected to Link-Belt's board of directors was **William J. Kelly,** president of Machinery & Allied Products Institute.

Malcolm D. Shaffer has been named executive vice president of Saco-Lowell Shops, Boston. He was formerly vice president, treasurer and secretary. He will remain as treasurer. He is also president of the company's wholly owned subsidiary, Pawtucket Spinning Ring Co. **Robert M. Jones,** chief engineer, was named vice president in charge of research and development.

Norman F. McCarthy has been elected vice president of Mack Mfg. Corp. and appointed director of purchases. He will make his headquarters at Mack's Allentown, Pa., plant.

Edwin M. Miller has been named plant superintendent, Machine Div., Lincoln Electric Co. A 29-year Lincoln veteran, Mr. Miller has been in the production control department since 1929, heading the department for ten years. His appointment follows the resignation of **K. F. Kneen,** manufacturing vice president of Lincoln.

Fred W. Richardson has been appointed general superintendent of Heppenstall Co.'s Pittsburgh plant. He succeeds **Paul H. Daley,** who was named general manager of the company's reactivated Eddystone plant.

William H. Peters has been named manager of manufacturing, Willys-Overland Motors, Inc. Mr. Peters learned the tool and die trade at Willys-Overland in 1916, joined Ford Motor Co. for more than 30 years, spent a year and a half with Hupp Corp., then returned to Willys-Overland in November, 1951.

Reed M. Andress (left) elected president and general manager, Barnes Drill Co., Rockford, Ill., succeeding W. M. Fairbairn (center) and Roger Marriott, named executive vice president, as announced in AM March 3, p205

Charles W. Lee has been appointed vice president of production of the Consolidated Western Steel Div., U. S. Steel Co., Los Angeles. He succeeds **Lloyd Earl,** resigned. Since 1946, Mr. Lee has been vice president in charge of operations at the Orange, Texas plant of U. S. Steel.

Charles R. Crowder, vice president and general manager of the Van Norman Co., Springfield, Mass., has been elected first vice president and a director. Two new vice presidents were elected: **T. W. Baush,** general export manager for Van Norman and its subsidiary Morse Twist Drill & Machine Co., of New Bedford, Mass., and **George H. Dickinson,** sales manager for the Automotive Div. Mr. Crowder has been with Van Norman since 1929 when he joined the sales staff. He became sales promotion manager in 1937, vice president in charge of the Automotive Div. in 1945 and vice president and general manager in 1951. Mr. Baush has been with Van Norman for 28 years, Mr. Dickinson for 20 years. **Alexander Sellers Jr.,** former Buffalo district manager for Warner & Swasey Co., was named sales development manager for the Van Norman Machine Tool Div.

A. Gilbert Formel has joined Lowey Construction Co., Inc., New York, a subsidary of Hydropress, Inc., as projects manager for heavy hydraulic presses, die forging and extrusion plants. **Howard Terhune** joined Lowey as project design engineer in charge of the Counter-Blow Hammer Div.

Sheldon V. Coleman has been named sales engineer, Norbide Div. and Floors Div., Norton Co., Worcester, Mass. He succeeds **Henry O. Richter,** retired after 38 years.

Roger M. Knox

Roger M. Knox, assistant to the president, Fellows Gear Shaper Co., Springfield, Vt., has been named chief of the machine-tool section, Metalworking Equipment Div., NPA.

Gen. Joseph T. McNarney (Ret.) has been elected president, Consolidated Vultee Aircraft Corp., San Diego Calif.

William A. Burns Jr., has been named president of Trailmobile Inc., Cincinnati, subsidiary of Pullman Inc., succeeding **George M. Bunker.** He has been vice president and general sales manager since 1950. **S. E. Biggs,** general manager of manufacturing, was named vice president in charge of manufacturing.

Charles W. Stone, former secretary of Interstate Drop Forge Co., Milwaukee, has been elected a vice president and director. **C. C. Bremer** was named secretary-treasurer.

Otto Svoboda has been named sales manager of E. W. Buschman Co., Cincinnati. Previously he had been with Chisholm-Moore Corp., Tonawanda, N. Y., and Robbins & Myers, Co., Springfield, Ohio.

Garvin A. Drew has been named assistant vice president, Scovill Mfg. Co., Inc., for the Schrader Div., Brooklyn, N. Y. He will continue as general sales manager. He also serves on the Schrader Div. executive committee and the board of managers.

William Carlson has been named to represent E. W. Bliss Co., Canton, Ohio, in western Michigan, with his office at the Hastings, Mich., plant. Sale of Bliss presses in the territory was previously serviced by a dealership arrangement. Berrien and Cass counties, Michigan, are to be serviced by the Bliss Chicago office.

Ralph S. Howe, executive vice president, New Britain Machine Co. and newly-appointed director of NPA's Metalworking Equipment Div. (left) and Swan E. Bergstrom, vice president, Cincinnati Milling Machine Co. and retiring director of the Metalworking Equipment Div. (center) look on as Noble B. Clark, machine-tool sales manager, Warner & Swasey Co., views a gift from friends at Washington farewell party as he retires from NPA post

David R. Warner has been named sales manager of Miller Electric Mfg. Co., Appleton, Wis., to succeed the late **R. A. Metcalf.**

R. J. Foreman, general sales manager of Mid-West Abrasive Co., Owosso, Mich., has been elected a director, to fill the vacancy on the board occasioned by the death of **Phil Huber.**

Harold C. Erskine, manager since 1943 of the Cleveland works of Aluminum Co. of America, has been named assistant division manager for Alcoa's die casting operations.

Herman Muller, previously general foreman, has been named assistant superintendent in charge of night operations of Texas Engineering & Mfg. Co., Inc., Dallas, Tex.

OBITUARIES

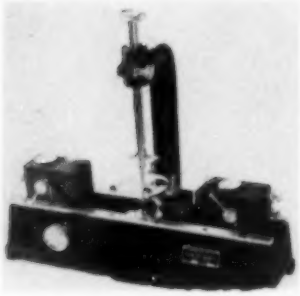
George McGregor Morris

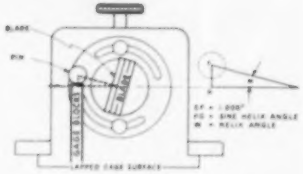
George McGregor Morris, 82, founder and chairman of the board, Morris Machine Tool Co., Cincinnati, died March 27. Mr. Morris retired in 1935. He had been president of Morris Machine Tool, and had also founded John B. Morris Foundry, now out of business.

George H. Nye

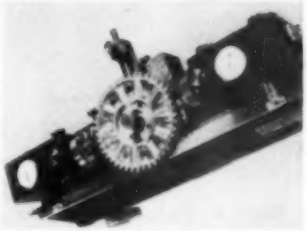
George H. Nye, 57, president, Circular Tool Co., Providence, R. I., died March 19. He, and the late W. B. Hopkins founded the company in 1923 to specialize in the manufacture of circular cutting saws. Mr. Nye became president in 1938 after Mr. Hopkins death.

New Shop Equipment





Computing and setting the adapter for production helix check is both simple and rapid



Orlandi gear checker with helix adapter is shown here checking the helix angle. The adapter cuts computations to a minimum

Rolling attachment is being used here in making rapid production gear check. Note adapter for assuring alignment of gear

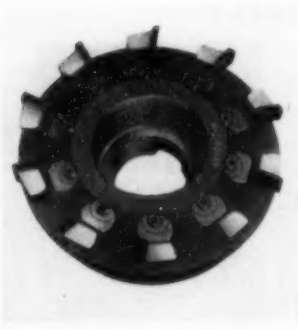
Helix Adapter for Orlandi Gear Checker

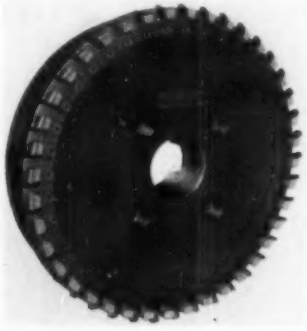
The adapter simplifies setup for checking helix angle — practically eliminating mathematical computations. The size gage-block required for setup is determined by taking the sine of the helix from the trig table, subtracting ½ the diameter of the adapter pin, and adding the net result to a constant etched on the machine.

A new rolling attachment for use with a master gear makes possible the rapid check of pitch diameter and concentricity to 0.0001 in. With this attachment, backlash can also be checked with mating gears or master gears.

The Orlandi gear checker itself is used for determining concentricity without a master, parallelism, backlash, root diameter, crown on face of tooth, tooth to tooth spacing, and accumulated error at 90 or 180°. It can also check size and concentricity of OD of ground gears, including those with odd number of teeth where a micrometer cannot be used.

Orlandi Gear and Machine Co., 16195 Meyers Rd, Detroit 27, Mich.





Universal Milling-Cutter Bodies Take Many Kinds of Blades

McCrosky universal face mills and shell end mills are said to be economical for both short and long runs on different metals, and for fine-pitch, high-speed carbide milling.

The shanks of the blade are round and the holes for the blade and a blade-locking-wedge overlap radially on center in the alloy-steel body. This provides space for up to 4 times as many blades as the cutter dia if extremely fine pitch is desired. A groove in the shank of each blade engages a tongue in each blade slot in the body, assuring accurate positioning of the blade shank on center. Consequently, the desired "hand" and proper cutting angle is secured by simply inserting blades of proper design for the direction of rotation desired, and the metal being cut.

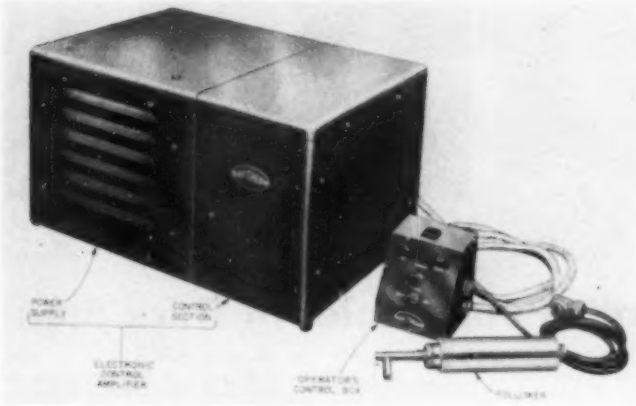
A single body can be used for any cutting requirement including right-hand or left-hand rotation; with carbide or high-speed blades; using positive or negative angles.

McCrosky Tool Corp., Meadville, Pa.

A self-energizing locknut is an all-metal seating type that is usable over and over. A grooved washer at the bottom of the nut is pressed over the threaded section suspended from the main body of the nut. It is available in various materials and will withstand temperatures up to 1600 F without excessive expansion or threaded seizure.

Klincher Locknut Corp., 2153 Hillside Ave., Indianapolis, Ind.

Materials and Parts

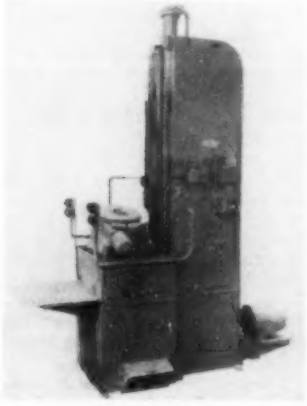


Raytheon Single-Motion Duplicator Feels Master Contours Electronically

The single-motion duplicator is used in turning shafts, bearings, pulley sheaves, commutator rings, and similar parts of irregular contour. It has been used in die-sinking operation, and in producing cams of complicated design on milling machines. In many of these applications, it is reported the average time for completing a single part has been reduced as much as 80% and spoilage by 20%.

It consists of a follower, an electronic control unit, and an output drive motor. The follower is a variable-reluctance transducer whose electrical output varies in accordance with the contours of a templet. The signal is amplified and detected in the electronic control unit, providing drive to the output motor. The motor, in turn, positions the follower and cutting tool to reproduce the contour.

Raytheon Mfg. Co., Waltham 54, Mass.



Surface Broaching Machine Conforms to J.I.C. Standards

A 72-in. stroke, 15-ton vertical hydraulic surface broaching machine is equipped with a fixed hydraulic cylinder to operate the work slide which is guided in adjustable hardened and ground ways. The ways have an extra-large cross-section to provide long life.

The machine, which conforms to J.I.C. standards, is named the SB-72-15. It has a receding work table and an automatic indexing unit to broach 95 Xmas-tree form slots in turbine wheels. It is also available with 90- and 120-in. stroke.

American Broach and Machine Company, Ann Arbor, Mich.

... INCLUDING

Punching units with hydraulic stripping action are independent units, with all component parts in the holders page 200

Squaring shears use air power, thus eliminating parts such as gears, flywheel page 200

Welding positioner uses gas burners to keep work at uniform 600 F page 201

Boring and drilling machine has variable-speed control by PIV gearing page 213

Automatic thread roller features ease of setup, accessibility to working parts, and heavy construction page 216

Automatic feed for stamping presses can be mounted without press alterations page 218

42-in. grinder for machining jet-engine compressor wheels has automatic feed cycle, timer controlled page 220

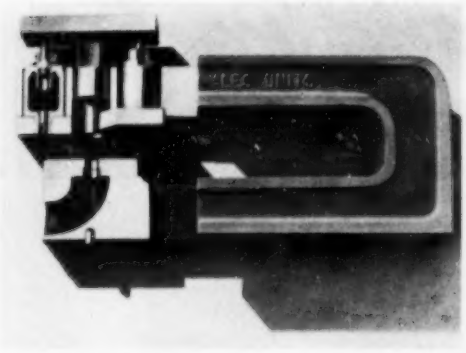
Multi-position locating device positively locates parts for machining page 222

Clamp on die caster automatically takes up die clearance due to expansion and contraction of the molds page 224

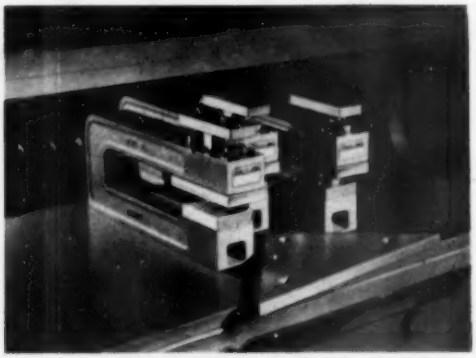
... and in April 28

Automatic pipe and tube cutoff machine handles 12-in. dia work with little operator fatigue.

Radial-play gage gives fast, accurate measurements of the internal clearance in ball bearings.



Cutaway view of the punching unit shows two Hydra-Springs, one on each side of the punch. Hydraulic pressure (through a compressible fluid) instead of springs is to provide stripping action



A templet setup of the Wales punching units in a press-brake. Note the ¼-in.-thick work in the foreground with shaped and round holes. The units may also be set up on rails or T-slotted plates

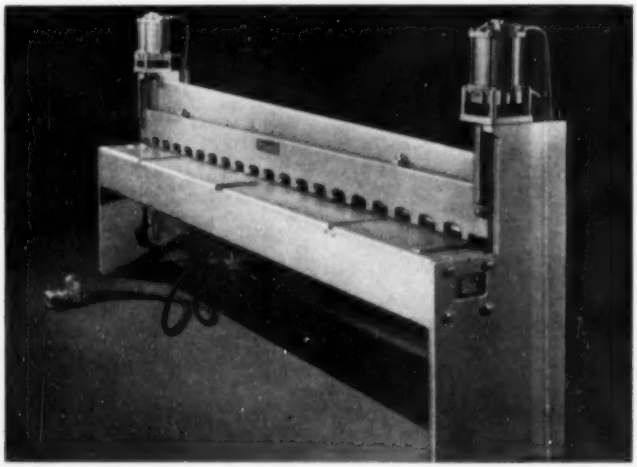
Independent Units Punch Holes in Thick Steel

The heart of these units for punching holes in mild steel up to ¾ in. thick is the Wales Hydra-Spring, which provides many times more stripping pressure than mechanical springs of the same volume. Pressure may be changed by a simple adjustment of fluid volume.

The units are independent and self-contained—all component parts are built into the holders. Unlike conventional dies, nothing is attached to the press ram. The only function of the ram is to depress the punch.

The same group of units may be set up on templets or T-slotted plates in stamping presses and on rails, strip templets, or T-slotted plates in press-brakes. This interchangeable use of the same group of units permits setups of unlimited punching patterns.

Wales-Strippit Corp., 345 Payne Ave., N. Tonawanda, N. Y.



Air-Power Squaring Shear Eliminates Most Parts

The simplified construction of these shears eliminates such parts as flywheels, gears, clutches, motors, and electrical controls — thus reducing initial cost and maintenance. Air from any system with pressure of 70 or 80 psi is all that is necessary.

Depressing the foot valve automatically clamps the hold-down and lowers the crosshead to complete the cut. Releasing the foot treadle instantly returns them to top position. A flexible air hose for the treadle permits the operator to trip the shear from any convenient location.

All main components are formed from welded steel plate with the adjustable ways made from non-metallic laminated plastic to avoid scoring and cutting.

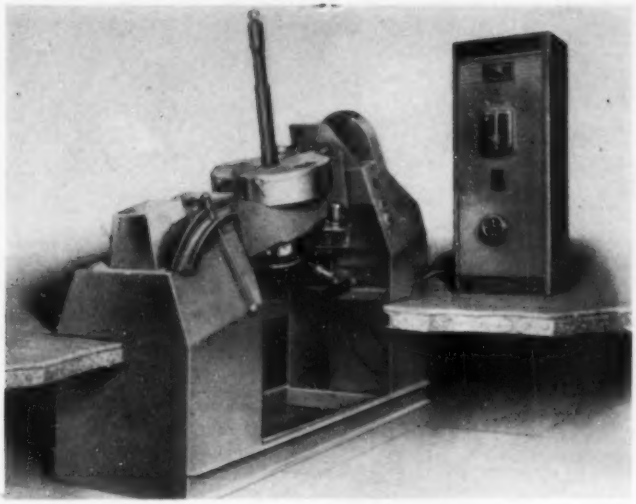
The hold-down gives good visibility of the cutting line. A quick-adjusting back gage is standard equipment on the smaller sizes and a micrometer, ball-bearing, double-bracket parallel back gage graduated in 1/128 in. is on the 8- and 10-ft lengths.

Niagara Machine & Tool Works, 637-697 Northland Avenue, Buffalo 11, N. Y.

New Grade of Cutting Carbide

This new carbide is known as Grade S-6 and is claimed to be highly efficient where the nature of the job makes slow speeds necessary. Even though it can be used at high machining speeds, its greatest tool life is obtained at speeds slower than those for most other carbide grades. It is therefore especially suitable for use on old or slow-speed machines. It is also claimed to be excellent for interrupted cuts.

Greenleaf Corporation, 512 Franklin Avenue, Wilkinsburg, Pittsburgh 21



Syracuse Welding Positioner For Jet Turbine Wheels

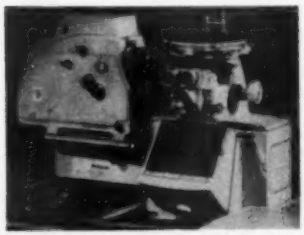
In welding the turbine bucket wheel to the forged shaft of a turbo jet engine, high quality of weld is required, and the welding must follow strict specifications. The bead is laid down on both sides of the wheel in an exactly defined sequence, and the welded area must be kept at a temperature of 600 F.

The Syracuse positioner consists of a cradle which is power rotated through 180° so that welding can be performed on both sides of the assembly. The work is carried on a variable-speed rotating spindle and is enclosed by power-operated insulated doors equipped with welding ports. Thus the operators have clear access to the work and yet are protected from heat and splattering.

The assembly is maintained at 600 F by means of gas burners controlled by motor-operated gas valves, and with manually-operated secondary air valves. An interlocking system of electric controls maintains ignition, firing, and gas pressure.

Welding speed can be varied as required by means of a special heavy duty variable-speed gear reducer designed to withstand chipping-hammer blows without injury to the gear train. The positioner is designed for hand welding, but can be easily adapted to automatic welding.

Syracuse Special Machine Co., 4010 Court St., East Syracuse, N. Y.



Metallograph for Microscopic Study of Metal in Polarized Light

This desk-size metallograph permits microscopic study of metals under polarized light as well as phase and bright-field illumination. Final focusing for photography is accomplished quickly, automatically, and accurately while examining the specimen through the parfocal visual system.

A quadruple revolving nosepiece permits rapid change of objectives. A separate built-in illuminator is used for visual examination. Four special built-in photographic eyepieces operate in a quick-change slide. No charts or tables are needed in determining optical settings.

The centerable rotating stage has verniers graduated in degrees, and built-in coordinate motions, 20-mm in each direction.

A phase diffraction plate is built into the same slide as the analyzer. The vertical-illuminator focusing lens permits sharp focus of the annular diaphragms on the phase plate. A centering telescope is standard equipment.

Offering both phase contrast and polarized light, the unit is said to be of particular use in dealing with anisotropic metals, identification of non-metallic inclusions where polarized light is required, examining unetched specimens, or determining differences of level of areas within a specimen.

American Optical Co., Southbridge, Mass.

Portable Battery Charger Works at Fast or Slow Rate

This battery charger weighs only 28 lb, but at the same time, it charges at a full 80-amp rate, includes ammeter and a time switch which automatically shuts down the fast rate.

The unit will charge a single battery at a slow rate or several batteries in parallel at a slow rate. The fast rate shuts down to a safe finishing rate of 10 amp when the time switch runs back to zero, thus more fully charging the battery.

The Baldor Electric Co., St. Louis, Mo.

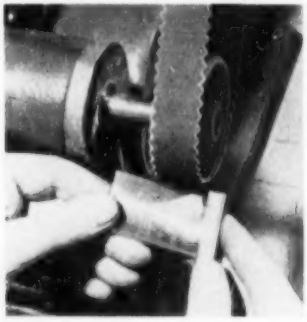
A cold-spray bonding solution for product finishes can be applied with ordinary spray equipment. It eliminates preparatory steps such as cleaning, rinsing, drying, etc. It is simply sprayed on the product where it dries immediately, ready for application of the final finish. Called Phospray, it can be used on all metals except aluminum and can be cut as high as three parts thinner to one part solution without reducing its effectiveness. It will withstand conditions of humidity, salt spray, etc., while furnishing the bond for a coating of paint 150 mm thick. It is available in 120-lb containers.

Du-Lite Chemical Corp., Middletown, Conn.

Japanese Thread-Rolling Machine

It is claimed the Tsugami machine can be operated for fast mass-production of Class-3 threads by unskilled labor. Finished surface of thread is extra smooth and accurate. Diameter of thread that can be rolled range from 3/16 in. to 13/16 in., with length up to 2¼ in. Imported by:

Bell Equipment Co., 4459 Santa Fe Ave., Los Angeles 58, Calif.



Scallop-Edge Abrasive Belt Finishes Jet Turbine Blades

Known as the 3M abrasive belt, it is designed for automatic precision grinding and finishing of jet turbine and compressor blades in a single operation. The scallops of the belt curve around the edges of the contact wheel, allowing fillet areas to be polished on the edge. Two separate steps were previously required to finish-grind each of the more than 2000 blades in a jet engine—foil grinding and root grinding. Use of this belt on an automatic grinder makes it possible to produce a completely finished blade in a single operation.

The belt may be used on crowned, contoured, or rounded-edge wheels, or with shaped backup supports, and can be used either by machines or by hand.

Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul 6, Minn.

Scully-Jones Drill Stop Uses Threaded Lock Bushing

Drill stop is used on turret lathes, drillpresses, and radial drills for operations where close control of depth is required. It will stop on fixture bushing or work.

A threaded lock bushing provides quick adjustment of the stop collar. To insert or remove tools, simply loosen setscrew and slip stop collar from threaded shank. A quarter turn of the setscrew forces the bushing against the shank threads for a positive lock. The small body dia permits operation of the stop on close centers or near shoulders.

It is made from an alloy steel with all points of wear hardened for long life. The four chip grooves tend to remove any chips from the surface on which it stops. It is available in 8 sizes having Morse taper shanks and holes.

Scully-Jones & Co., 1902 So. Rockwell St., Chicago 3, Ill.

Automatic Cut-Off Saw For Non-Ferrous Metals

The machine uses a high-speed, carbide-tipped, circular saw blade to cut off aluminum shapes up to 3x5 in., or aluminum solids up to 2x4 in. Some cuts of 2x4 aluminum bar stock of 24 ST hardness take less than 8 sec and are held to remarkably close tolerance. Maximum capacity of the vise and 12-in. saw blade is 3½x6 in.

Known as the Comet MH, it is easy to operate. The work is placed in the vise and the foot control depressed to actuate the pneumatic-hydraulic feed ram, lock the vise, and make the cut. When the cut is completed, the saw automatically retracts to the starting position, the vise opens, and the work is released. If during the cut the operator removes his foot from the control, the saw immeadiately stops its forward motion and retracts, the vise remaining tightly locked until the blade is clear of the cut.

Multiple V-belts drive the saw arbor and pulley sizes can be changed to give any mandrel speed required by the blade in use. Feed rate of the ram is infinitely adjustable from 0 to 24 fpm.

Maximum travel of ram is 11 in. with adjustable stops. The ram assembly is mounted on a cast semi-steel column which raises or lowers by hand crank at foot of table. The column locks in position by self-aligning V-wedge. An air regulator, lubricator, and air cleaner are furnished as standard equipment.

(Continued on page 204)

Get the most out of your LELAND-GIFFORD DRILLING MACHINES

A valuable feature of Leland-Gifford design is that you can readily step up the capacity and speed of operation or broaden the adaptability of existing machines at any time by adding:

COOLING SYSTEM to machines furnished without coolant.

POWER FEED to machines furnished with hand feed.

BACK GEARS to provide eight speeds on machines now with only four.

RAISING BLOCKS and LONG TRAVERSE SPINDLES to handle higher work or deeper holes.

HYDRAULIC FEED to replace hand or power feeds for deep hole jobs.

TAPPING ATTACHMENT for drilling and tapping applications.

Modernizing or extending your Leland-Gifford drilling machines is an economical and effective way to increase productive capacity without waiting for complete new equipment. It's worth looking into. Write for complete information.

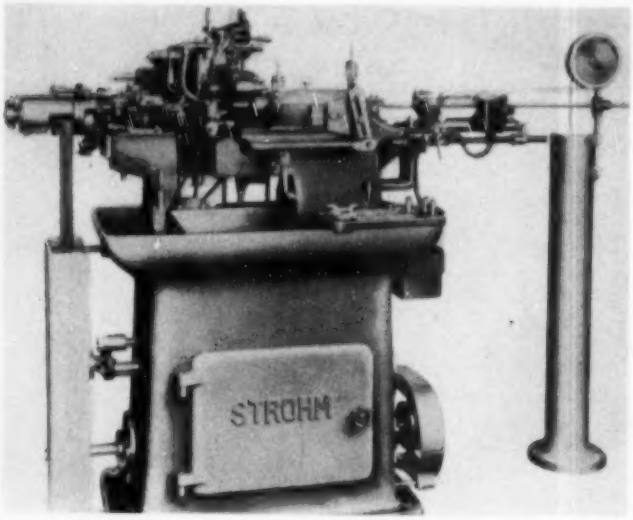
SAVE TIME — CONTACT THE OFFICE NEAREST YOU

LELAND-GIFFORD
Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.

The vise is air-operated and has a swivel base. The removable steel jaws are 2x4 in. The movable jaw is infinitely adjustable from 0 to 6 in. Basic price of the machine, as specified, crated and ready for shipment, is $1890 F.O.B. Los Angeles, Calif.

Consolidated Machinery and Supply Co., Los Angeles, Calif.



German Long-Turning Automatic

Small screws, nuts, bolts, spindles, pinions, and other precision components for clocks, instruments, and other products can be produced to extra-close tolerance at high rates of production on the Strohm automatic. Second-stage machining to attain final dimensions is not necessary on this machine. While designed for production runs, it can be used economically for short runs because of the ease of setup.

It handles thread lengths up to 1.378 in. and bore depths up to 1.575 in. Accessory equipment permits turning tapers up to 4 in. long. Available accessories include: rapid power traverse; three-spindle drilling and threading attachment; slot-cutting attachment; and an attachment for centering and counterboring.

Two models are available, differing in the sizes of bar stock handled. Type M75 takes up to 0.276 in round, 0.197 in. square, 0.236 in. hex; M105 is for 0.394 in. round, 0.276 in. square, and 0.315 in. hex.

Kurt Orban Company, Inc., 205 East 42nd Street, New York 17, N. Y.

Overload Release for Dodge Speed Reducer Prevents Breakdowns

An overload release for the Dodge torque-arm speed reducer is said to provide instant and positive protection for driven machines, motors, and the torque-arm reducer itself.

The release operates both mechanically and electrically to (1) loosen the belts (2) cut off the current (3) activate a warning bell.

Pressure exerted by an excessive load causes a piston to move lengthwise through the unit and this movement loosens the belt and cuts off the current simultaneously. The warning system is hooked to a micro switch.

Called the Tri-matic, the release is calibrated for adjustment to the load conditions of any job. It can be set to act at any desired load up to the reducer's maximum capacity.

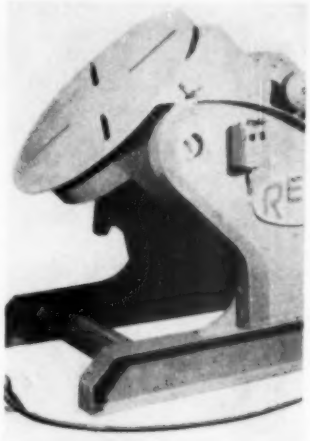
To reset the unit after it has been tripped, the speed reducer is pulled manually into position. This automatically cocks the overload release mechanism.

Dodge Manufacturing Co., Mishawaka, Ind.

Manganese Replaces Nickel In Group of Stainless Steels

New group of stainless steels uses manganese to replace all or most of the critical nickel used in conventional chromium-nickel stainless steels. The chromium-magneses alloys, some containing no nickel and some with only minor additions of that element, have been introduced as suitable alternates for specific applications previously filled by the 18-8 stainless steels. Production is in substantial quantities.

Allegheny Ludlum Steel Corporation, Pittsburgh 22, Pa.



Welding Positioners Have Variable Table Rotation

These welding positions are available in two models; one with 1000-lb capacity, the other with 2500-lb capacity. The design features a compact three-in-one table tilting frame. Rotation speed can be varied through a 10 to 1 speed range by means of a handwheel adjustment. Both models are available with either hand or power tilting of the table through a 135° angle and they are equipped with tilt indicators.

Optional equipment includes a rotating welding-current ground device directly upon the table spindle, and magnetic starters with limit-switch protection for tilting.

Reed Engineering Co., 1003 W. Fairview Ave., Carthage, Mo.

Hjalmar Ellstrom

INVENTOR OF THE GAGE BLOCK

The achievement of perfection . . . the mastery of any art, craft, or science . . . is a rare human accomplishment. A discovery or an invention that contributes to the total welfare of all mankind is rarely the heritage left by a single man. So rare is it, indeed, that in such infrequent instances, the true facts surrounding its origin are often distorted, or even lost in the conflicting claims of others who would seek the worldly gains to be derived from undeserved fame.

So it was with the Gage Block. For, actually, this basic standard of measurement used the world around was originally conceived and invented solely and entirely by . . . Hjalmar Ellstrom. Here, briefly, is the story of his accomplishment:

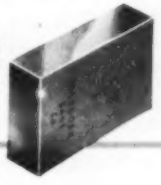
During the early 1890's, Hjalmar Ellstrom was employed by the government rifle factory at Eskilstuna, Sweden. He was a master craftsman . . . a man of infinite patience who took great pride in his work. He was a man of vision, too, who recognized the limitations imposed upon industry by the lack of sufficiently accurate measuring devices. So, with a then unheard of standard of precision as his ultimate goal, he alone developed and perfected his checking instruments and techniques . . . then alone he created the world's first gage block accurate to the infinitesimal millionth part of an inch.

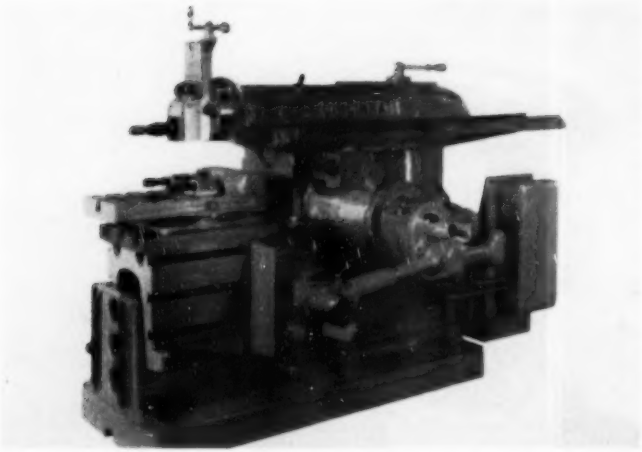
Today, though his achievement has been copied and imitated by others, his personal unqualified devotion to accuracy is the exclusive heritage of Ellstrom . . . *now measuring in millionths for three generations.*

ELLSTROM STANDARDS DIVISION

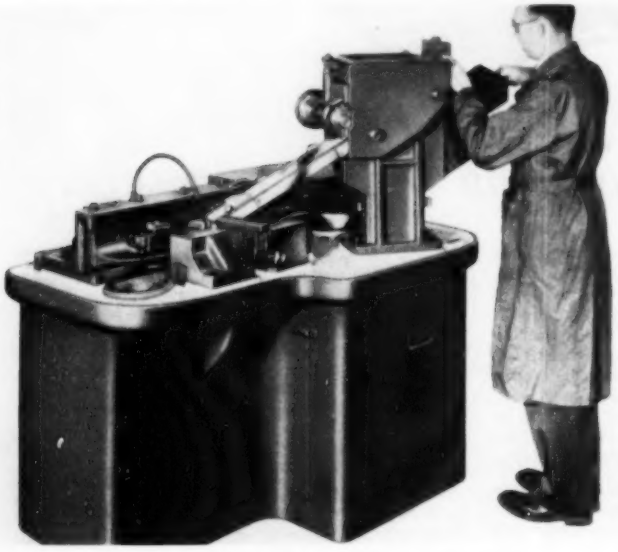
DEARBORN GAGE CO. • 22035 BEECH ST. • DEARBORN, MICH.

Originators of Chromium Plated Gage Blocks





ELECTROMAGNETIC CLUTCH AND BRAKE ON SHAPER provide instant starting and stopping with a single finger-tip control lever. The ram can be positioned quickly and accurately for setting tools—up to 30% of total time on some jobs. There is no adjustment on the clutch or brake required for the life of the friction surfaces—which are estimated to last up to 15 years of normal operation. Torque remains constant throughout operating life. — *Cincinnati Shaper Co., Hopple & Garrard Streets, Cincinnati 25, Ohio.*



Hartford Automatic Thread Roller

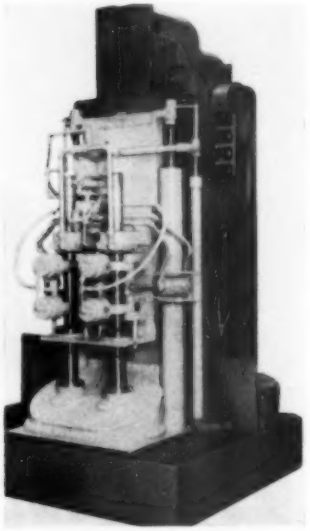
The Model A-312 H will roll machine screws from size No. 6 to 5/16 in. in diameter and thread lengths up to 2½ in. Production rates are 80, 100, 120, and 140 pices per minute depending upon size of screw to be rolled. Floor space required is only 4x6 ft. Height from floor to the table hopper-and-chute unit is 53 in.

Standard die demensions are 15/16 in. thick by 5 in. long for the moving die, and 15/16x4¼in. for the fixed die. Standard die depths are 1, 1½, and 2⅛ in. with a special depth of 2⅝ in. available.

Features are: streamlined design, heavy construction, ease of setup and accessibility to working parts.

After rolling, screws are automatically ejected into a funnel which leads to a tote box in the rear of the machine. The machine is equipped with a 5-hp motor with starting switch and automatic cut-out for overload safety.

Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.



MACHINE FOR BORING AND COUNTERBORING a 4.2-in. chemical mortar shell is capable of turning out 56 parts per hour at 100% efficiency. Machine is a heavy-duty, two-spindle inverted type utilizing hydraulic feed. A No. 6 Morse Taper drill provides for use of pick-off speed-change gears. Oilgear hydraulic feed pump is arranged for individual motor drive and the gear box is located in the base. — *Baker Bros. Inc., Toledo, Ohio*

Rust-preventive paint is said to dry in 10 min under normal drying conditions with one coat providing excellent hiding of the old metal surface. It will withstand temperatures from −100 F to +250 F and is resistant to salt air and fumes. The paint may be applied over damp surfaces, interior or exterior, galvanized metal, and new or rusted metal surfaces of all kinds. The process leaves an attractive semi-gloss finish in several colors, aluminum, and clear.

United Laboratories, Inc., Cleveland 12, Ohio

tool steel is our pride and joy!

Think of tool steel — think of Crucible! That's the reputation we've had for over half a century with our tool steel users. We've never stopped working to maintain our leadership . . . leadership that has kept us the country's *number one* tool steel producer.

Crucible research and development continues to match Industry's need for new and improved tool steels. You can profit from the experience gained by Crucible in the application of tool steels to thousands of uses. Our metallurgical service is freely available to you . . . and our conveniently located warehouses maintain a full supply of tool steels for prompt delivery.

SEND TODAY for the unique Crucible Tool Steel Selector — a twist of the dial gives the tool steel for your application.

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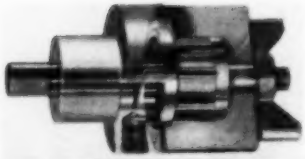
9" diameter, 3-colors

CRUCIBLE first name in special purpose steels

52 years of Fine steelmaking

TOOL STEELS

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.



Compact Pump for Light Fluids Has Long-Life Roller Vanes

The Magna-Mite, a low-priced positive-displacement pump of compact size, has a capacity from 1½ gpm down to ¼ gpm and less. It is suitable for handling fuel oil, gasoline, hydraulic fluid, lubricating oils, and other light-viscosity fluids.

It is similar to vane pumps in operation and construction, but differs in that vanes are replaced by rollers that contact the outer case as in a roller bearing. Rolling friction thus replaces sliding friction between the vanes and pressure chamber with an increase in pump life of between three and five times over conventional vane pumps.

The action of the rollers against the inner periphery of the pressure chamber forms an oil wedge between the contacting surfaces to insure proper lubrication at this point. Vanes are hydraulically balanced.

The pump is cylindrical in shape, a form recognized as the most economical for accommodating mechanisms in any given space. Dia is 2¾ in., length, 6 in. over-all.

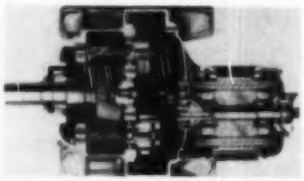
The *constant displacement* and *adjustable displacement* models (Types A and B) are suitable for machine lubricating applications or pumping fuel oil for industrial or domestic oil burners. In the B pump, the discharge volume is easily adjusted by turning a thumb lever mounted at the back end. This adjustment can be made with the pump rotating or stationary. Provision is made for locking the adjustment, although locking is not required.

Variable and reversible displacement is provided in the Type C, and a lever may be used to permit either manual operation or remote automatic control. In this type of pump, with the motor and pump operating continuously in one direction, it is possible to:

1. Adjust the delivered fluid volume to suit the job.
2. Vary the volume delivered at any part of a cycle.
3. Reverse the flow.
4. Completely stop the flow.

The Magna-Mite Pumps have a practical speed range of from 300 to 3600 rpm. They are rated at 1750 rpm. The rotor shaft has a flat for the driving connection. Antifriction or sleeve bearings are used, depending on the nature of the application and the lubricity of the fluid being handled.

Milwaukee Hydropower Inc., 3447 N. 35th St., Milwaukee 16, Wis.

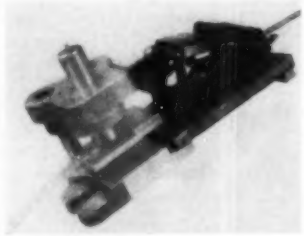


High-Torque Low-Speed Motor With Gear Ratios up to 175 to 1

By the use of two secondary pinions driving the output gear, the effective torque rating of this motor is doubled. The load is distributed equally between these two pinions by a splined herringbone pinion.

Available in 1 to 10 hp with speed ranges of 5 to 25 rpm, the Type GM has normalized castings, asbestos-protected windings, solid centricast rotor, and Lubriflush lubrication.

U. S. Electrical Motors Inc., 200 E. Slauson Ave., Los Angeles 54, Calif.



Press Feed for Coiled Stock Is Cam-Operated

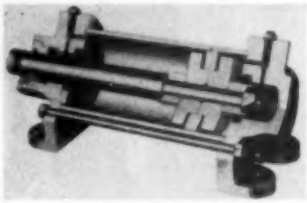
An automatic hitch-type press feed for mounting on the die set or bolster plate is cam-operated, but does not rely on the cam to obtain or maintain accuracy of pitch.

It grips the stock firmly under spring pressure while being fed into the press tool, but at a predetermined point before the die starts to work the material its gripper releases and the stock is free to float in response to die pilots or metal-flow requirement of forming operations. Slippage due to stock inertia is controlled thus maintaining accuracy of pitch. On the return stroke the gripper remains open, for minimum of wear on the gripper blade and freedom from surface scratches on any stock with a polished finish.

The press feed will operate from any side of the die set to which the cam is attached and will feed the stock on either the up or down stroke of the punch press ram. A ratio of 2 to 1 exists between the distance stock travels and the lateral movement of the cam roller, consequently a feed length of 2 in. can be obtained on a punch press having only a 1-in. stroke.

The tool will feed any thickness of coiled stock up to 3/32 x 2-in. wide and transmit a maximum feed length of 2½ in. from zero movement in an infinite number of pitches.

Jaco Devices, Inc., 90 High St., Hingham, Mass.



Tomkins-Johnson Air Cylinder Has Flexible-Cushion Sealing

The flexible seal used in these air cylinders is claimed to: (1) provide positive cushion action (2) automatic valving for fast return stroke (3) eliminate the binding and sticking found where close metal fits are required to affect a seal (4) lower friction factor and (5) automatic compensation for wear.

The packing nut has a pilot dia which assures good alignment. The female adaptor is an integral part of the nut. This new packing nut also adds rod bearing length, and eliminates separate female adaptor ring.

The metallic male adaptor ring used in the piston-rod stuffing box gives added support to the chevron packing, thereby extending life of rod packing and increasing sealing efficiency.

The metallic rod-wiper ring affords permanent protection from dirt and grit.

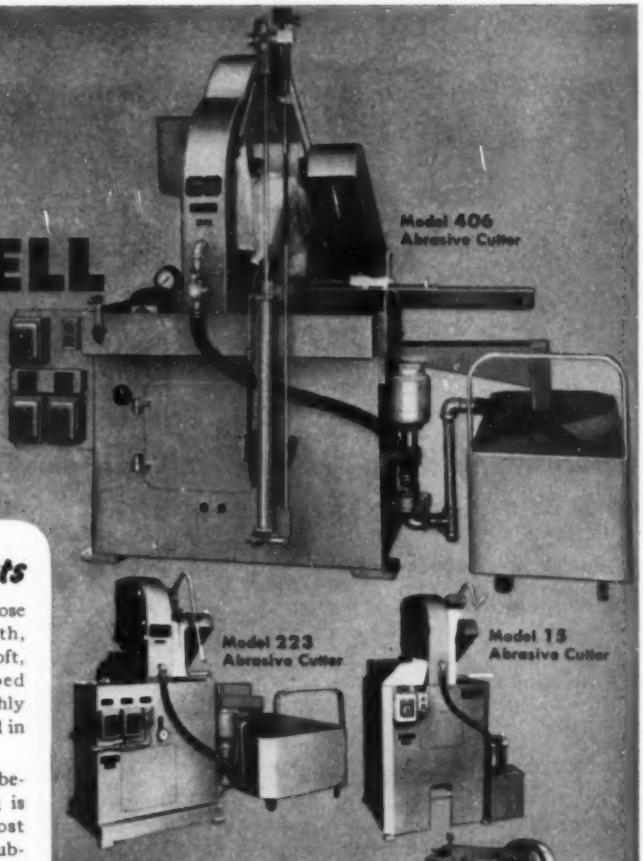
Two flexible bronze rings mounted in synthetic rubber wipe off harmful substances by means of their knife-edge conical surfaces. This action is self-adjusting through action of the rubber on staggered scraper rings.

Capacities are 100 to 12000 lb for power movement in any direction.

The Tompkins-Johnson Co., Jackson, Mich.

an ACCO product

CAMPBELL ABRASIVE CUTTERS



Reduce Cutting Costs

● You make fast, accurate, close tolerance cuts—with a smooth, straight finish—from hard or soft, round, hex, square, or shaped stock. Work and wheel thoroughly cooled. Wheel entirely enclosed in steel safety guard.

Abrasive cutting costs less because it is fast, no annealing is necessary, and smooth, almost burr-free ends often eliminate subsequent operations.

Tell us what you cut, and ask for "*Principles of Abrasive Cutting*." We'll make recommendations.

and CAMPBELL NIBBLERS

High speed, variable stroke. For cutting sheet metal to any desired shape . . . quickly and inexpensively.

ACCO

TRADE MARK

CAMPBELL MACHINE DIVISION
AMERICAN CHAIN & CABLE

923 Connecticut Ave., Bridgeport 2, Conn.

CAMPBELL
Abrasive Cutters
and
Nibblers

Gasoline-Engine-Driven Arc Welder In Stationary or Trailer Model

This gasoline-engine-driven arc welder has the control panel located at the generator end of the unit for easier adjustment of the welding heat.

The generator is of the symmetrical, 4-pole multi-range design and uses four laminated main poles and four interpoles which are removable. Single-unit brush rigging holds the generator and exciter brushes in a fixed neutral position.

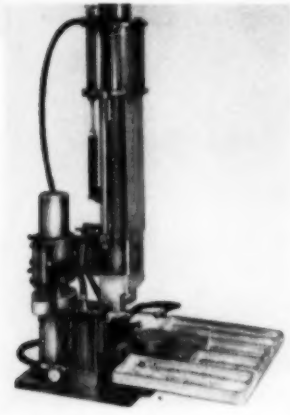
Control of the 1000 combinations of welding current and open circuit voltage is accomplished by a large handwheel (for the ten main ranges) and a volt-amp adjuster (for 100-step fine adjustment).

An oversize, inbuilt, 4-pole exciter provides prompt voltage buildup to the welding generator and is also a source of auxiliary power of 110 v, 1 kw, for operating lights and tools.

A Chrysler industrial engine powers the generator. Engine speed is controlled by a constant-speed flyball governor, operated by a V-belt from a separate pulley on the engine crankshaft. An idling device slows the engine down when the arc is broken and brings it up to operating speed when the arc is started. A mercury time-delay switch allows sufficient time to change electrodes without slowing the engine.

The unit is available stationary or mounted on a pneumatic-tired four-wheel trailer.

The Hobart Bros. Co., Troy, Ohio



Operating Speed Increased In Winter Staking Press

Improved Winter staking press is capable of 100 or more strokes per minute—the maximum rate being limited only by the nature of the work and the skill of the operator. It has a built-in quick exhaust valve and a simplified air rejection system to remove work automatically from the lower die. Like earlier models it is a bench-mounted unit for light staking, forming, and other secondary press work in which speed, precision, and easy operation are important.

It capable of delivering an accurately controlled impact from 0 to 12,000 lb, or a squeeze up to 12-times air-line pressure. The stroke may be set for one or two inches. A slide feed is available for use on the press and has the following features: built-in hydraulic control of slide speed; stroke of two or three inches adjustable as desired; adjustable air blow-off of work; and safety guard.

Winter Products, Inc., Box 5112 Barnum Station, Bridgeport, Conn.

Self-Contained Unit for Precise Hard-Chrome Plating

This bench-model plating unit requires a space of only 2x3 ft, yet all controls, transformers, rectifiers, switches and heating elements, including the plating tank are contained within the unit. A current source and duct outlet are the only connections required for immediate operation.

Construction of the unit is of angle-iron. The tank is lead-lined Armco iron and this lining can be changed for the plating of other metal. Tank heating is accomplished by easily removed 1500-watt electric heaters.

Rectifiers are horizontally forced-air cooled by a fan and bath temperature is thermostatically controlled. All circuits are overload-protected with self-resetting, heater switches.

The unit provides a recified source of dc power up to 100 amps at 0 to 12 volts.

The Cro-Plate Co. Inc., Hartford, Conn.

Industrial dust pan is on wheels to facilitate the removal of debris. It is of light-weight all-welded construction and weighs only 45 lb. Metal pan measures 18x18x18 in. and is made of 15-gage sheet steel. Frame is of 1x1½x⅛-in. angle iron with handle of 1-in. tubing. Over-all height is 48 in.

Palmer-Shile Co., 16019 Fullerton, Detroit 27, Mich.

You can do it . . .

Firth Sterling

with . . . STANDARDS

STANDARDS *Better* *Faster* *Cheaper*

Write for these quick reference cards today

R-192 —Standard Tips and Blanks

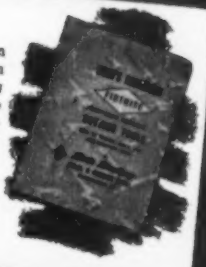
SA-1013—Standard Brazed and Mechanically Held Tools

R-194 —Standard Wire, Bar and Tube Drawing Dies

SA-1012—Standard Mining Tools

SA-1021—Standard Discarb Perforators and Bushings

For information on the adaptation of Firth Sterling Standards to special applications, use the *New* FIRTHITE HANDBOOK—a complete tooling reference.



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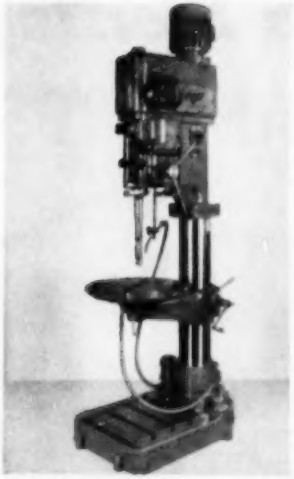


Boring and Drilling Machine Has Variable-Speed Control

This heavy-duty column boring and drilling machine from Germany features quiet and smooth running and variable speed control during boring by installed P.I.V. gearing. It uses a wide range of speeds with high and middle numbers for boring, low numbers for threading. An indicator mounted in the drill-head allows for rapid regulation of right cutting speed and drilling capacity.

The machine has drilling capacity of 1¾ in. in cast iron. Diameter of column is 6 in. Maximum distance spindle-center to column-face 13¾ in.

The feed of the boring spindle is either automatic, or by means of a 3-handle star wheel, or with a small handwheel for precision adjustments. Tapping on this machine is simple, as it is equipped with depth stop and pushbuttons for motor reverse, so that specal tapping heads are not required.

The boring table is raised and lowered by a crank handle on the rigid column. It can be rotated 360° and revolved around the column. It is equipped with T-slots and a coolant water groove.

Coolant equipment consists of an electric plunger pump which is not affected by dirt, and the complete feeding and delivery pipes. The base-plate is fitted as a coolant tank. Suitable openings for cleaning are provided. It uses a 3-phase, 3-hp motor housed in the drillhead.

Imported by:

Eric R. Bachmann, 27-11 41st Ave., Long Island City 1, N. Y.

A floor-marking machine is said to make it possible to mark safety and parking lines within ⅛ in. of obstruction. The unit can be operated by one man using one hand to guide and control it. Gravity-fed paint flow is adjustable to accommodate the operator and the job by pistol-grip trigger control. The machine holds 1½ gal. of paint, lacquer, or whitewash. The unit weighs less than 20 lb and is made of heavy-gage metal having all-welded seams.

H. C. Sweet Co., 12083 Woodbine Ave., Detroit 28, Mich.

Self-Energizing Clutch For High Initial Torque

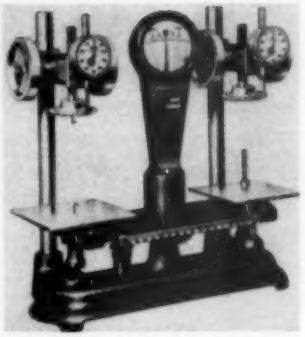
This automatic-centrifugal clutch, a self-energizing type, is designed to provide maximum efficiency of any gasoline engine or electric motor wherever load-starting requires a high initial torque.

Normal speed of the engine or motor on which the clutch is installed is reached before any load is applied; then automatically and smoothly the load is picked up. Stalls or slowdowns below normal operating speeds are eliminated. The clutch automatically disengages when speed is reduced for idling.

Chattering is eliminated and positive release of the clutch is provided by the outward and rearward movement of the shoe. When engine speed exceeds the tension of the clutch springs — a predetermined point — gentle engagement of the drum is made at a point to the rear of the direct central impact point. Engagement speed is controlled by interchangeable springs.

The clutch is manufactured in four standard models with various pulleys available as optional equipment. Special applications can be supplied to fit any requirement.

Clutch Division, Elgin Sweeper Co., 5 Oak St., Elgin, Ill.



Testing Machine for Close Control of Coil Springs

The spring-testing machine is essentially an even-balanced weighing scale mounted on a base, with a sponge-rubber pad underneath to minimize vibration.

Scale has a builtin dashpot to dampen the oscillation of the pointer and pans in testing. Behind the weighing pans are mounted standards which support the spring-like measuring devices.

It is available in two models, the smaller measures the load up to the nearest one-hundreths of an ounce and to a capacity of 3 lb. The larger model measures loads to the nearest fifth of an ounce to sixteen pounds. Basic use of the machine is for load testing, either by sampling or 100% methods, but it can be used for determining the spring gradient for a check of free height in relation to load, and the effect of wire size on load. The determination of closeout load when approaching solid height can be readily made.

It is particularly valuable for measuring initial tension in extension springs. The machine can also be used for checking the effect of heat-treatment and plating.

Torrington Manufacturing Co., Torrington, Conn.

A flooring material called Roc-Wood is composed of hardwood fibers chemically treated and bonded together with a plastic binder. The combination of wood, chemical, and plastic is said to result in a smooth, skid-proof, practically indestructible floor surface. It will bind itself to almost any substructure without underlayments. It is laid with a trowel using pre-mixed ingredients and hardens by chemical action within 24 hours. In appearance the material resembles cork flooring.

Roc-Wood Flooring, 364 E. 23rd St., Chicago 16, Ill.

for

- increased production
- greater versatility
- wider range of work
- LOWER COSTS

Here's an all-hydraulic controlled tracer with a DUAL PURPOSE . . . for tracing from round or flat template and regular lathe work with unlimited range for both.

Note how simple: just position one lever on clutch and brake unit to engage or disengage the tracer . . . that's all. No loss of time, no extra space, no parts to bother with, no extra expense for a single-purpose tool.

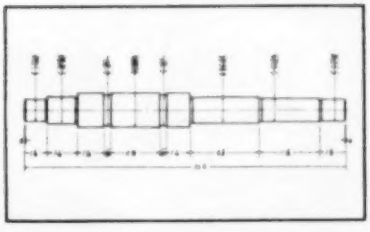
ABSOLUTELY SAME PRECISION ACCURACY AS WITH ALL SIDNEY PRODUCTS. Contour changes of the master piece are transmitted through the ultra-sensitive tracer valve as magically as if by an "electric eye" . . . even sharp shoulders are faced to amazingly close limits.

ADD the Sidney Fluid Tracer to any Sidney Model 32 Lathe. You'll enjoy the savings and efficiency of

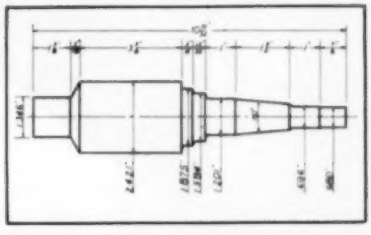
THE FINEST TURNING TOOL EVER PRODUCED

Please write for detailed literature or contact your nearest Sidney representative.

AMAZING SAVINGS THROUGH SIDNEY TURNING TIME



Normal Turning Time
4 hrs. 33 min.
SIDNEY TURNING TIME
38 min.
YOU SAVE
3 hrs. 55 min.

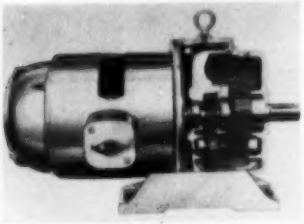


Normal Turning Time
25 min.
SIDNEY TURNING TIME
2 min. 31 sec.
YOU SAVE
22 min. 29 sec.

The SIDNEY MACHINE TOOL Company
Builders of Precision Machinery
SIDNEY — ESTABLISHED 1904 — OHIO

Lighting panelettes are now available with either lugs or circuit breaker mains from 2 to 40 circuits for use on ac lighting and appliance branch-circuit applications. The panelettes incorporate thermal-magnetic "plug-in" circuit-breaker units rated 15, 20, 30, 40, or 50 amps mounted on cylindrical bus bars. The circuit-breaker units are interchangeable with those of the MO-12 and MO-20 load centers. The units bear Underwriters' Laboratories approval and label. They are available for use on single phase, 3-wire or 3 phase, 4-wire ac systems.

Square D Co., 660 Rivard St., Detroit 11, Mich.



Reuland Gear Reducer With Internal Fluid Coupling

This gear reducer consists of a standard Reuland Fluid-Shaft motor and gear train designed into a single, compact unit. The integral fluid coupling provides cushioned starting of heavy loads and protection against jamming of equipment. Application will be in machinery where heavy loads require smooth acceleration at reduced motor speeds.

The power take-off shaft, gears, and bearings are located immediately adjacent to the vertical centerline of the pyramidal base. Load pull is thus transmitted direct to the base, minimizing any lateral stress. Gear and bearing wear are reduced and mounting in close quarters is made easier.

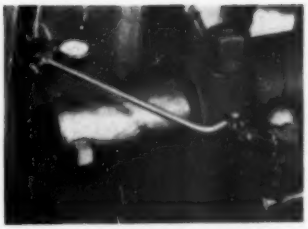
Helical gears are used and they operate in an oil bath. They are hobbed from special alloy steels.

The reducers are available with squirrel-cage, fluid-shaft, or slip-ring driving motor, either poly or single phase. The gear train can be single or double reduction. All are available in either drip-proof or totally enclosed designs with output speeds from 1 to 600 rpm.

Reuland Electric Co., Alhambra, Calif.

A lubricant for rolling operations, called Palmoshield, is said to have all the chemical characteristics of palm oil. It looks, feels, acts and handles like palm oil and requires no changes in rolling mill operation for the production of tin plate.

Ironsides Co., 270 W. Mound St., Cleveland, Ohio



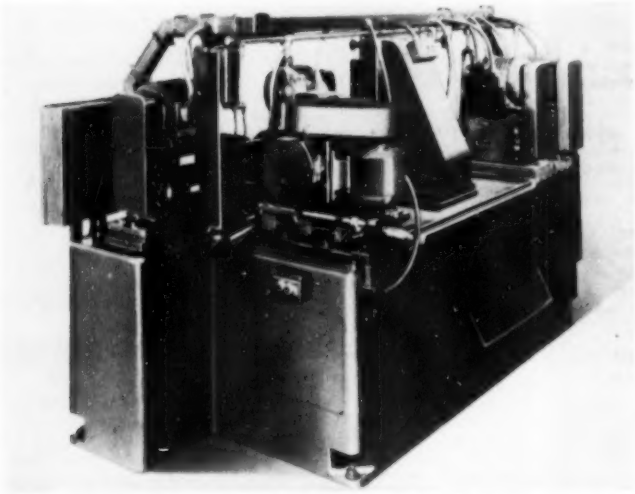
Magnetic Dial-Indicator Holder

The Model-200 magnetic holder has a precision adjusting device controlling the positioning of the dial-holding rod. This prevents spring tension in the rod lifting the indicator off the work after the rod and indicator is placed by hand.

Operation: The machinist swings the holding rod and indicator to within ½ in. or so of the work. Then, by turning the thumb screw on the magnetic base, he can make fine adjustment either against or away from the work without touching the rod or indicator.

The magnetic base is made out of Alnico and has a 45- to 50-lb pull. The holder rod is set in a ball socket, permitting universal settings. Adapter bushings are available for use with indicators having 5/16-or ⅜-in. openings. Price for holder—$4.95.

Cullen Mfg. Co., Racine, Wis.



TRANSFER MACHINE takes solid cold-drawn stock and drills it, countersinks, broaches flats on both sides, cuts it off to accurate length, and finally chamfers both ends of the cut-off pieces. The machine handles 300 differential pinion shafts per hour at 100% efficiency. The hydraulic transfer unit ejects the completed piece to a chute and receives the next section of bar stock to be cut off. —*The Motch & Merryweather Machinery Co., 715 Penton Bldg., Cleveland 13, Ohio.*

Conveyor Available in Straight or Curved Sections

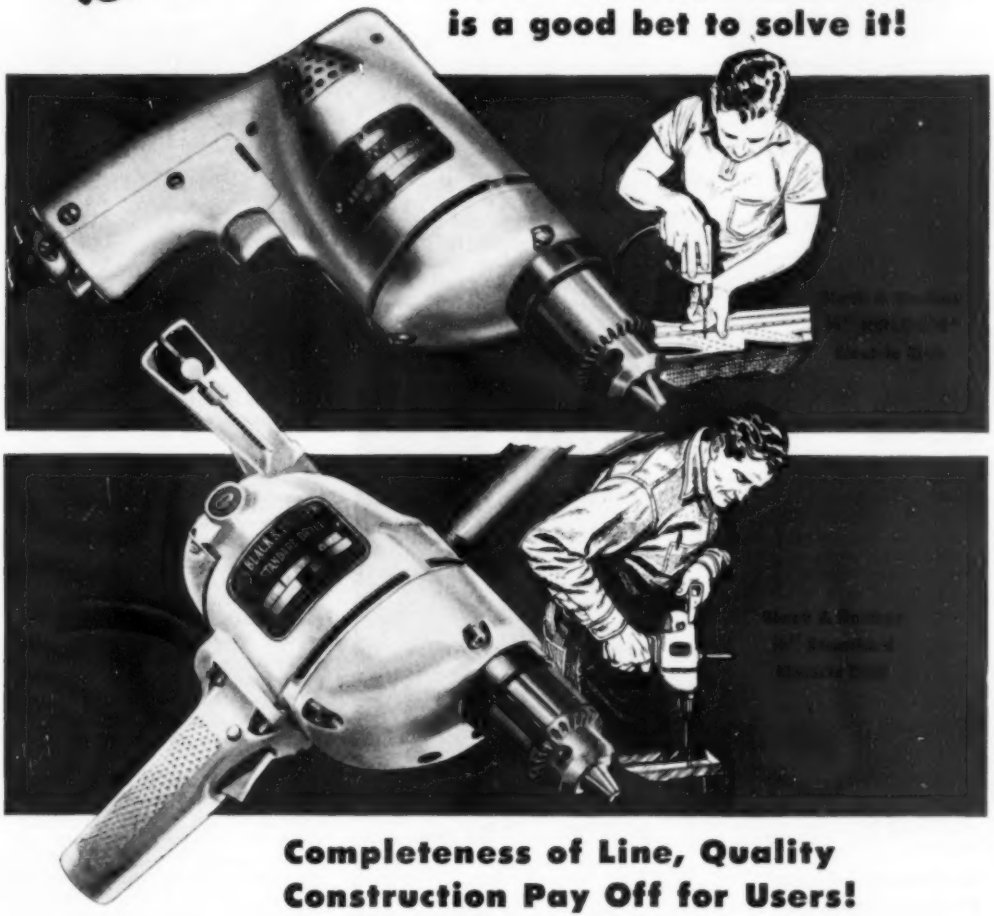
Twelve-inch-wide heavy-duty Load-Veyor is made in 5- and 10-ft sections, with 45° and 90° curves to suit special and individual needs. Ball-bearing wheel 2 in. in dia. and ⅝ in. wide are spaced on slightly less than 3-in. centers. It is available with welded-on connectors which are inter-connectable with the majority of other wheel conveyors of the same size.

The weight of a 10-ft section is only 69 lb. Standard arrangement is with the wheels set above the side channels. The units are rated to take loads of 100 lb covering the surface of the conveyor and for individual loads up to 300 lb per unit.

Market Forge Co., Materials Handling Div., Everett 49, Mass.

Drilling Problem?

Black & Decker's Drill Line is a good bet to solve it!



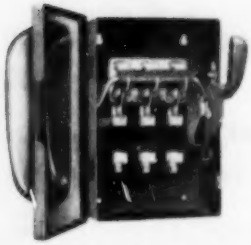
Completeness of Line, Quality Construction Pay Off for Users!

FOR drills to fit your needs—for top performance on any portable drilling job—it pays to check Black & Decker *first!* That's because Black & Decker gives you an unmatched choice of Drill models. Capacities from ¼" to 1¼"—choice of handle arrangement for easiest operation—choice of speed, power and price in most capacities. And it's also because Black & Decker Drills give you powerful B&D-built motors—full ball-bearing construction—extra-tough gears, shafts and chuck spindles—husky housings, streamlined design, perfect balance.

Whether your problem is in production, maintenance or construction—whether it requires large or small drills—see your nearby B&D Distributor *first* for expert help. And write today for free, detailed catalog to: THE BLACK & DECKER MFG. CO., 616 Pennsylvania Ave., Towson 4, Maryland.

B/D Black & Decker TOOLS

WORLD'S LARGEST, MOST COMPLETE LINE



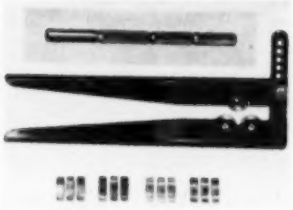
Line of Safety Switches Meet W-S-865 Specifications

A complete line of safety switches, in ratings to 2400 amps, 600 v, and 50 hp, meet the recently adopted federal specifications W-S-865. The line is available in three types, A, C, and D, and all bear Underwriters' Laboratories approval.

Type-A switch operates continuously without excess heating. All current-carrying parts are silver plated for low resistance contact. Blade hinges are spring reinforced for pressure contact. Fuse clips are spring loaded.

Type-C switches also meet the specifications for medium-duty and general service, while type-D switches are approved for light-duty service such as lighting loads. Double-throw switches are intended for service transfer switches.

Square D Company, 6060 Rivard St., Detroit 11, Mich.



Hand-Operated Knurler Eliminates Setup Time

This is a hand-operated knurler that may be used with a lathe, drill press, or if no machine tools are available, the work can be held in a vise and the knurler rotated around it.

Because it is held in the hand it eliminates all bothersome setup operations formerly required. It does not require work to run dead true, as it not only knurls concentric surfaces, but surfaces that are off-center as well. Adjustable, it will accommodate parts ranging from 5/32 in. to 2 in. in diameter, knurling any length desired.

It is made of heat-treated steel that is blued for rust protection. It is furnished with a set of three knurl rollers which cut the popular medium diagonal pattern. Additional knurl rollers may be obtained in fine, medium, or coarse, in the straight or diagonal patterns.

M.P.A. Co., 1678 W. 17th Place, Los Angeles, 6, Calif.

Quick-connecting hooks are said to be a simple sure way of instantly attaching and detaching lines to other lines, wire rope, rope or chain, or to fixed objects. They are instantly joined or detached by just a turn of the fingers. Once joined they cannot come apart until intentionally disconnected. The hooks are made from tough corrosion-resistant manganese bronze, and are also available made from aluminum-base Ternalloy. They are supplied in all sizes any types with fast or fixed-eye hooks, swivel hooks, fixed-jaw, etc.

Brummel Hook Co., Chicago 40, Ill.

Grinder-Miller Turns At 15,000 to 45,000 rpm

With accurate quill and collet chuck, this multi-purpose, electrically powered grinder-miller turns at controllable speeds from 15,000 to 45,000 rpm. It uses a ¼-hp motor and can be adapted to grinding, milling, and finishing of small parts in production or toolroom.

Range of applications include internal, external, cylindrical, and form grinding; precision milling with HS steel or tungsten-carbide midget mills and saws; sawing, slotting, small-diameter drilling, finishing, and micro-finishing of hardened steel surfaces with diamond compounds. Work can be finished to tolerances within 0.0001 in.

Precise Products Co., 1328 Clark St., Racine 1, Wis.

Tachometer for Precision Speed Measuring Applications

This high accuracy Metron tachometer measuring to ¼% of any speed is said to be ideal for turbine overspeed tests, motor test stands, dynamometer test stands, laboratories, and similar precision speed-measuring applications.

Accuracy is sustained even under adverse external conditions by simple calibration adjustments, conveniently mounted on the front end of the instrument.

Ten overlapping and adjoining ranges, instantly selected by rotary switch, provide more than a 10 to 1 spread in speed. The indicating meter has three scales selected for good readability of minor divisions in integral numbers. Speeds of 36 to 100,000 rpm are covered by three models.

No vacuum tubes or other limited-life components are employed, and there is but one moving part in the indicator, the pointer, suspended in jeweled pivots. The unit is suitable for panel or bracket mounting. Hand engagement or fixed installation heads for a wide variety of speed-engaging applications are available for use with the indicator.

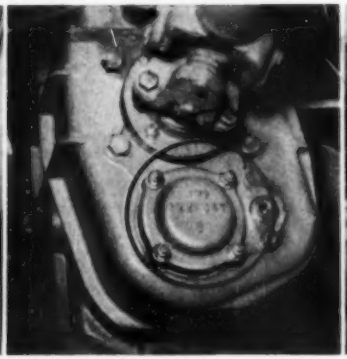
Metron Instrument Co., 432 Lincoln St., Denver 9, Colo.

Pliers with compound-leverage, and parallel-action of the jaws are available for jobs requiring parallel jaws and extremely high mechanical advantage. The tools are priced at $3.26 list with cutter and $2.20 without cutter. Length is 6½ in. in both sizes.

Utica Drop Forge & Tool Corp., Utica, N. Y.

For key applications on heavy-duty equipment

ENGINE MOUNTING . . . Powerful, high torque FWD engines are securely and dependably anchored with vibration-proof Elastic Stop Nuts. The Red Elastic Collar grips bolt threads firmly, withstanding the stress and shock of the most severe operating conditions . . . damping out even the most extreme vibration.

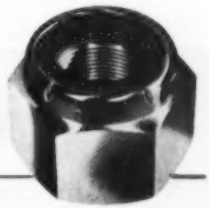


TRANSMISSION SEAL . . . Proper lubrication of heavy-duty working parts demands a tight seal, here assured by the application of Elastic Stop Nuts on this FWD transmission. The famous Red Elastic Collar seals against oil seepage.

CAB MOUNTING . . . With the rugged jobs that FWD trucks tackle, their powerful frames are subjected to severe stresses. Only a tough and tested self-locking device could be expected to remain tight—that's why FWD uses Elastic Stop Nuts on cab mounting bolts.

FWD TRUCKS

Four Wheel Drive uses Elastic Stop nuts



Uninterrupted service and minimum maintenance are vital to the customers of the Four Wheel Drive Auto Co., makers of special heavy-duty trucks. FWD is particularly conscious of the importance of unfailing bolted connections. They are using Elastic Stop Nuts at key points throughout their line, simplifying their own assembly as well as assuring better performance for their customers.

Resilient locking collars of nylon or fiber permit multiple reuse of Elastic Stop Nuts, and these self-locking fasteners have earned Army, Navy and Air Force approval. For design information on the wide variety of sizes, types and applications of Elastic Stop Nuts, contact your local representative—or mail this handy coupon.

ESNA

Elastic Stop Nut Corporation of America is also maker of ROLLPIN

ROLLPIN TRADEMARK

Dept. N7-49, Elastic Stop Nut Corporation of America
2330 Vauxhall Road, Union, N. J.

Please send me the following free information on ESNA self-locking fasteners:

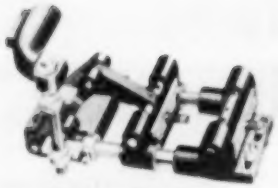
- ☐ AN-ESNA conversion chart
- ☐ Elastic Stop Nut Bulletin
- ☐ Rollpin bulletin and sample Rollpins
- ☐ Here is a drawing of our product. What self-locking fastener would you suggest?

Name _____ Title _____

Firm _____

Street _____

City _____ Zone _____ State _____



Producto Automatic Feed Features Fast Setup

Feed length for 1½ in. or more stroke	0 to 2 in.
For presses having 1-in. stroke	0 to 7 in.
Stock widths	up to 2 in.
Stock thickness	0.005 to 0.045 in.
Full feed-stroke dwell	5/16 in. max.
Weight	15 lb.

This feed for stamping presses is easy to mount and quickly setup for required feed length. Some of its features are: (1) Adjustable hardened and ground feed gripper plates can be reversed giving extra-long wear; (2) oil holes for lubrication are located at every slide or bearing point; (3) only two drive plates and a simple linkage, controlled by the movement of the press, are used to advance the stock; (4) pilots and other positioning means can be used; (5) can be mounted in any ordinary press without press or feed alterations; (6) the unit has front and rear stock guides.

Known as the Surefeed, a relatively high degree of accuracy is made possible by the direct feeding action. It is recommended, however, that pilots be used where exact register of stock is required.

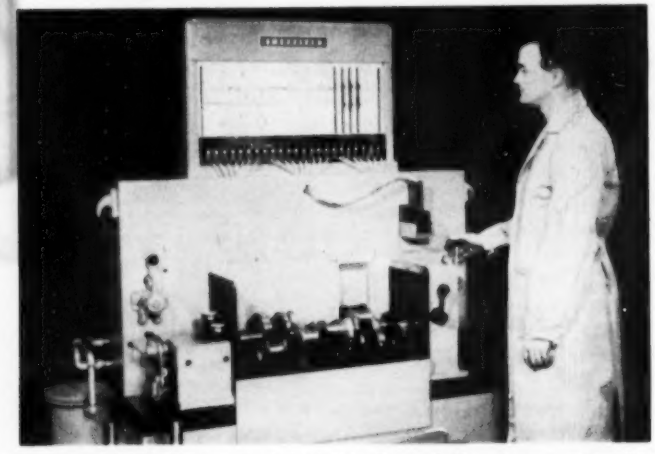
The Producto Machine Co., Bridgeport 1, Conn.

Air-hardened die steel is said to be more wear-resistant than oil-hardened type and therefore is ideal for punches or dies to be used on silicon or stainless steels, Monel metal or other abrasive metal. Chemical analysis of this die steel is carbon 0.95-1.05; maganese 0.50-0.70; silicon 0.30-0.50; chrome 5.00-5.50; molybdenum 0.90-1.10; vanadium 0.20-0.30. The steel is furnished in 43 ½x2 standard stock sizes from ½ x2 to 2x10-in. in 36-in. lengths. All sizes are accurately ground to a thickness limit of plus or minus one-thousandths with an extra-smooth surface finish of 25 to 35 micro-inches.

Simonds Saw and Steel Co., Fitchburg, Mass.

A self-locking pin, the Sel-Lok spring pin, is a heat-treated tubular slotted dowel pin manufactured in both standard and light-duty types. It is said to be an inexpensive and highly efficient hollow pin with chamfered ends permitting easy, rapid insertion. The pin becomes compressed as it is driven or pressed in place. When the pin is placed in the hole it remains tight and secure against vibration, but can be removed with a drift punch if required. The pin can be reused, and as the pin is self-locking, normal production hole tolerance is all that is required, eliminating precision reaming and costly peening operations.

Self Lock Fastener Corp., 259 Stephens St., Belleville 9, N. J.



A MACHINE FOR THE MULTIPLE GAGING of critical dimensions on automotive crankshafts—it checks main bearings for size and taper pilot-hole diameters; flange diameters and runout; thrust-bearing faces; keyway locations, etc. A hand lever is operated to actuate a hydraulic device automatically to lower the part into gaging position. A range of dimensions up to 34 or more can be gaged and read simultaneously by a glance at the float graph on top of the unit. The part is revolved on rolls to gage concentricities and runouts. A hand air snap is used for gaging the crankpins for diameter and taper in three places simultaneously on the journal. After gaging, the hydraulic device raises the part to unloading position. — *Sheffield Corporation, Dayton 1, Ohio*

Three-Phase Winding Head Winds Any Mush Coil

This three-phase winding head, winds any mush-coil for motors ranging from ¼ hp up to and including the General Electric 75-hp three-phase motor.

Feature of the three-phase head is the instantaneous-tension release. When coils are finished, the operator simply pulls out on the arms and turns the teeth to the inside. This principle releases the tension on the coils, permitting them to slip off easily. To set for rewinding, the teeth are merely turned outward, which automatically locks them in place. Four permanently attached cranks adjust the coil-winding arms equi-distantly in pairs from the center of the winding head. Easy-to read scales on each bar show settings for coils of any size from 2¼x5 in. to 11½x19½ in.

Set-up operation takes just a few seconds. A wire guide, mounted on the drive, permits faster winding and insures compact coils, is also furnished with the head. Finished coils are easily tied as there is sufficient room between the teeth on the coil. It may be attached to a lathe or the Crown coil-winder drive.

Crown Industrial Products Co., 1057 Park & Borden Aves., Sycamore, Ill.

Operator confidence soars—and so does production—with the Schrader Press Control. For this control is definitely a two-hand device. It is designed so that the hands that feed the die must also operate the press. Both hands must be used simultaneously for each operation of the press and cannot stray into the danger zone when the ram comes down.

This *increased safety* of Schrader's Press Control lets operators build a worry-free rhythm that puts new speed in your presses in just a short time.

What's more, Schrader Controls end the fatigue common with mechanical foot pedal operation—a Schrader-

Reduce Danger Here

equipped press can be run as easily as an ordinary typewriter.

Wherever you have a power press—or any machine with a mechanical clutch—there's a chance to increase safety . . . boost operator confidence and thus increase production with a Schrader Control.

Let us help you decide what will best fit your needs. Write, describing the machines you plan to equip—or fill out the coupon below.

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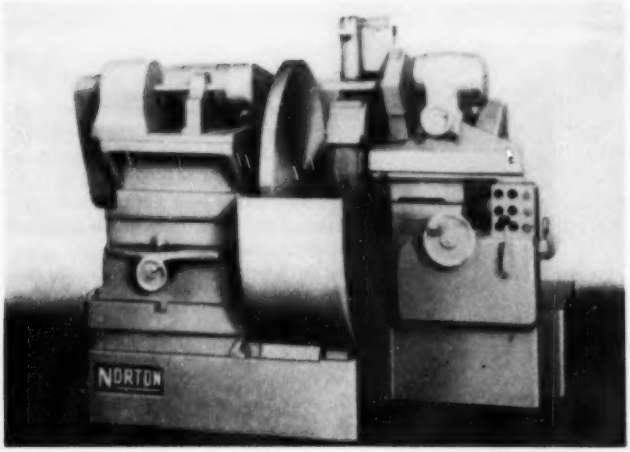


Norton 42-In. Machine Simplifies Compressor-Wheel Grinding

Here is a machine with special features for grinding jet-engine compressor wheels or similar work. Face plates, chucks, or other work-holding fixtures can be conveniently mounted on the workhead spindle. Maximum work capacity is 42-in.

The workhead is mounted on a swivel table and has longitudinal and cross adjustments. The workhead table also has longitudinal power traverse with automatic reversals from a hydraulic motor unit.

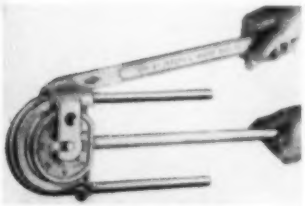
An automatic feed cycle, timer controlled, enables the operator to tend two or more machines. A hand wheel-feed mechanism is also provided.

An automatic wheel-guard device speeds truing of the external grinding wheel. It operates under push-button controls and can true the wheel with work remaining in grinding position.

For grinding internal surfaces, or for those surfaces that cannot be reached with the external wheel, an internal grinding spindle, mounted on the front of the wheelhead is available at extra cost. They are available to take grinding wheels from ⅞- to 7-in. dia., and the unit is quickly advanced or retracted along its dovetail slide.

The operator's position has been carefully considered. It provides good visibility of the grinding and plenty of clearance for work loading and removal.

The Norton Co., Worcester 6, Mass.



Combination Tube Bender Bends Both ½- and ⅝-In. O.D.

For copper, aluminum, brass, and other soft, thin-wall tubing, this unit has a dual-size shoe and mandrel which permits bending two different sizes of tubing without changing any parts.

It is of two-piece construction—quickly coming apart and slipping over the tube at the point where the bend is needed. Bends can be made to any angle up to 180°, and the tool is calibrated to show the degree positions. Over-all length is 21 in., and weight 3 lb. Construction is of steel and aluminum.

Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago 7, Ill.

An electronic counter predetermines two different selected counts occurring in sequence. The dual predetermining feature facilitates slowing down on the final stage of the cycle, to obtain satisfactory operation of gates, shears, and other devices. The counter will continuously recycle, accepting counts up to 1000 per sec. and reset instantaneously after each output operation without missing a single count. The output relay action may be either momentary, adjustable over the range from 0.01 to 0.1 sec. or SPDT stay-put, alternating positions as each predetermined count is reached. Ease in pre-setting is said to make this counter readily adaptable to any production line. By dial-switch settings any two numbers from 1 to 9,999 may be chosen as the counting points at which control actuation is to occur. Requirements for greater or less digital capacities can be met with standard models.

Potter Instrument Co. Inc., 115 Cutter Mill Road, Great Neck, N. J.

Hydraulic Lift on Crane Operated by Single Pump

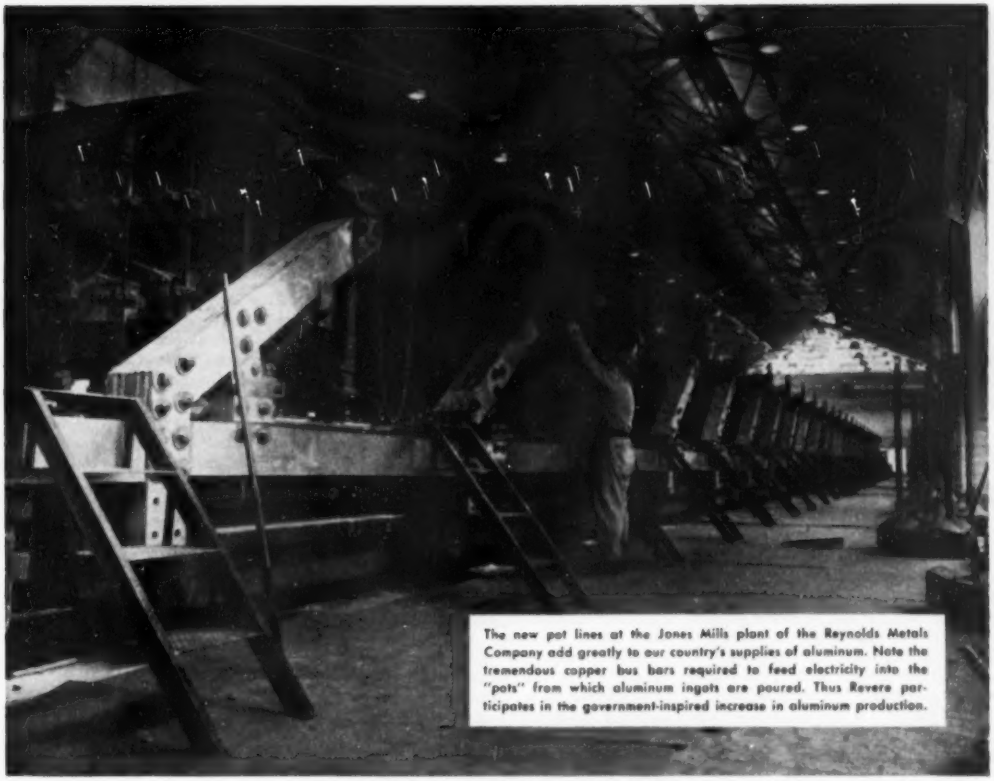
The Series-TM portable cranes have an all-welded girder construction with square instead of tubular members, and weighs somewhat less than its predecessor. It is operated by a hand pump.

The hydraulic lifting mechanism is a single-unit pump with variable speed and can be removed or reconditioned readily. There are no hose couplings to fail, and the pump has a built-in check valve to prevent sudden lowering of the load.

Known as the Mobilcrane, it is available in 1- and 2-ton capacities, with low- and high-mast styles at the same price in the two-ton model. Optional accessories include an attachment for stacking or moving miscellaneous drums or crates, a telescoping boom extension, and a cradle for moving transmissions and dual wheels into place.

Another model is equipped with a revolving base instead of legs and serves the same purpose as the movable chain hoist.

Lempco Products Inc., Bedford, Ohio.



The new pot lines at the Jones Mills plant of the Reynolds Metals Company add greatly to our country's supplies of aluminum. Note the tremendous copper bus bars required to feed electricity into the "pots" from which aluminum ingots are poured. Thus Revere participates in the government-inspired increase in aluminum production.

It takes a lot of REVERE COPPER BUS BAR to increase aluminum production

● The Government has directed Revere to produce millions of pounds of copper bus bar for the new aluminum plants being put into operation in order to increase the output of this light metal that is so essential to defense. Copper is the ideal metal to carry the heavy currents required for the "pots" that produce aluminum from the ore. Thus aluminum and copper are intimately linked together. Aluminum is used in planes, ships, weapons, missiles, ammunition, and in many other defense applications. Copper, best of all the commercial metals in electrical conductivity, likewise has many vital tasks to perform for our armed forces, afloat, ashore, and in the air.

Revere is glad that its large capacity for the production of bus bar is so valuable in these times; in our long history of over 150 years of service we have always given everything possible in times of our country's need. However, we are regretful that today's government requirements materially limit our ability to fill civilian orders. We look ahead, eagerly and hopefully, to the time when the present urgent demands are met to such an extent that orders for bus bar and other Revere products can be filled more promptly.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

* * *

Mills: Baltimore, Md., Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.

Sales Offices in Principal Cities, Distributors Everywhere.

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Medium- and Heavy-Duty Electric Tractors by Mercury

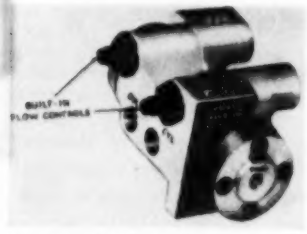
The medium-duty tractor (illustrated), designated Model A-545, has two-wheel drive and is rated at 400-lb. normal and 2000-lb. maximum drawbar pull. When powered by the specified 48-volt source it attains a light running speed of 7½ mph.

A tiller-bar controls the four-wheel steering system. Travel is manually controlled by a three-speed snap-action mechanical contractor unit. Foot acceleration is also available.

Other features of the medium-duty model include: cushion tires; semi-elliptical spring suspension; front and rear double-reduction spiral, bevel, and spur gearing; and unit constructed power plant.

The Model A-800-4 is a heavy-duty tractor powered by two series-wound enclosed motors capable of delivering 800-lb. normal and 5500-lb. maximum drawbar pull. The four-wheel drive, four-wheel steer unit is controlled by an automotive wheel steering assembly and a pedal accelerator. Four travel speeds in either direction may be selected by using the directional control mounted on the steering column.

The Mercury Mfg. Co., 4044 South Halsted Street, Chicago 9, Ill.



Four-Way Air Valve for Automatic Control of Piston Retraction

This air-control valve, Model MV-4-375, may be used with pilot valves to provide automatic and semi-automatic operations, sequence of operations, and remote control paneling. It is said to eliminate insufficient pressure or excessive dwell in air cylinders of 6 in. dia. or more. Rather than rely on the operator's judgement in controlling the valve for the correct amount of cylinder pressure, this pilot-operated valve is used in conjunction with two auxiliary bleeder valves. The momentary operation of either of the bleeder valves causes a shift in the valve spool, resulting in movement of a double-acting cylinder piston.

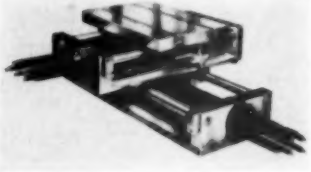
The bleeder valve causing the piston to advance is under control of the operator, and may be operated by hand, foot, or solenoid. After the piston has reached the end of its stroke, a predetermined amount of pressure builds up which opens the sequence valve. Since the sequence valve can be adjusted for the desired pressure, air is admitted to the pilot side of the pilot-operated bleeder valve, thus opening this valve and causing the master valve spool to shift, and return the piston to its starting position.

It is for use with air, oil, or water at pressures up to 0-150 lb., and is available for standard pipe sizes of ¼, ⅜, ½, and ¾ in.

Airmatic Valve Co., 1643 E. 40th St., Cleveland, Ohio.

Tang break-off tools for the removal of inserting tangs on helical-wire thread inserts operate on the principle of a spring-loaded center punch. The tools remove tangs quickly without disturbing the inserts. Fourteen standard models permit operations at production rates on the following sizes and lengths of stainless-steel Heli-Coil thread inserts: 6-32 to ½-13 sizes in the National Coarse Thread series to lengths of 1, 1½, and 2 diameters; and 10-32 to ½-20 sizes in the National Fine Thread series to the same lengths. For other sizes and lengths of inserts, special punch assemblies, interchangeable with standard handles, can be supplied.

Heli-Coil Corp., Danbury, Conn.



Multi-Position Locating Device Has 18 Stop Screws

This device, known as the Speedi-Spacer, is used in the location of parts for drilling, boring, or milling. Positive positioning is provided by 9 longitudinal and 9 transverse stop screws. Hardened measuring pads upon which these screws bear are an integral part of the unit. Longitudinal and traverse movements are determined by the various settings of the screws; table position is maintained by positive locks.

The base plate has ample space for mounting screw holes to fit any machine tool. Working surfaces are provided with two standard ⅜-in. T-slots. Drilling thrust plus the weight of the part being machined is carried on end-grain Formica bearing blocks which ride on ground steel ways.

Among the features claimed for the unit are: extra setup speed, elimination of costly jigs and fixtures, can operate as a satisfactory substitute for a costly jig borer in smaller plants. Since the Speedy Spacer does not become a permanent part of the machine it is used with, it can be moved to other machines as needed. It requires no auxiliary equipment outside of standard shop micrometers or vernier calipers.

The Queen City Machine Tool Co., 217 E. Second Street, Cincinnati 2, Ohio

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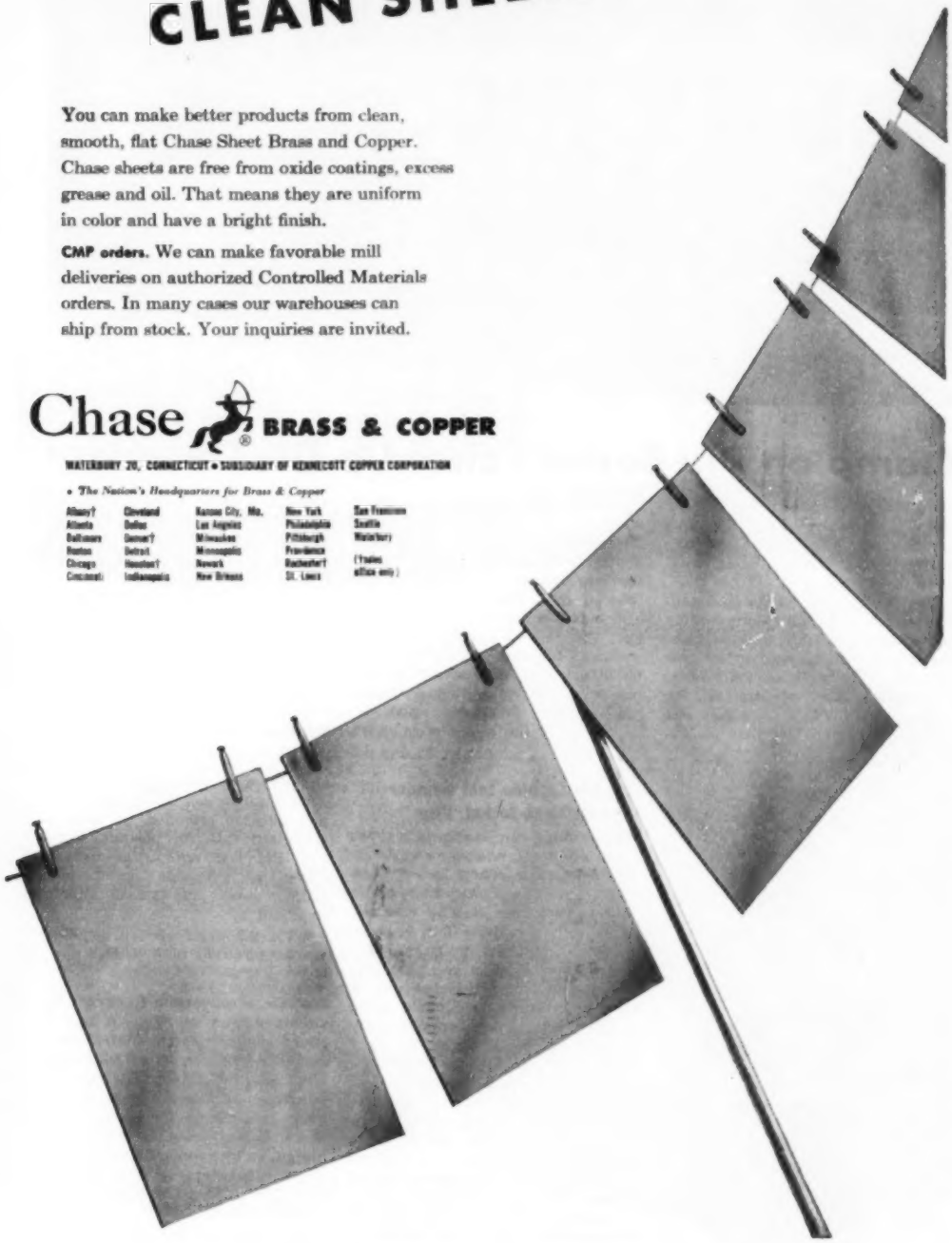

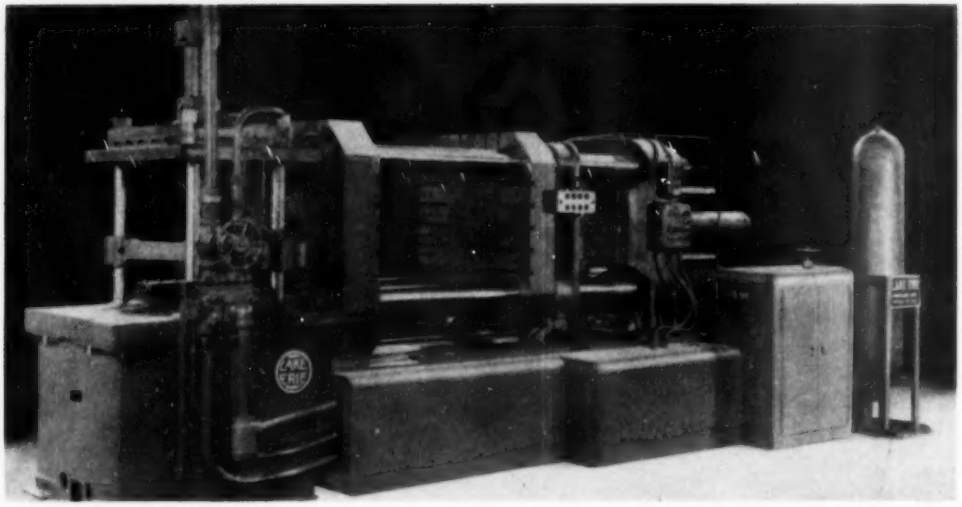

Clamp on Die Caster Takes Up Die Clearance

Two features, the Wedge Cam Toggle and the Pressure-Pac injection unit are claimed to have increased production on this die caster as much as 15 to 25%.

The Wedge Cam Toggle is a self-compensating toggle clamp which automatically takes up clearance in the dies due to contraction and expansion of the molds during production or shut-down periods. At the same time, it is able to engage and disengage without binding. A circular cam contact surface is used with rolls which guide the toggles during engagement and disengagement. The Pressure-Pac unit provides for 2 to 1 pressure increase at the time of solidification of the metal. This cuts down porosity and shrinkage.

Other features are: Simplified maintenance of all elements, including manifold valve blocks; faster job setups; jack-screw pedestal mounting of the injection cylinder which facilitates faster changeover from high or low positions of the injection sleeve. Hydraulic core pulls may be operated on four sides of the platen, and are controlled by an electrical interlock which prevents die jam.

The machines are available in 10 models, ranging from 100- to 1000-ton capacity for all the usual non-ferrous metals and alloys.

Lake Erie Engineering Corp., 700 Woodward Ave., Buffalo 17, N. Y.

Constan Carbide-Tool Grinder Uses Ball-and-Socket Vise

This grinder can handle all types of carbide tools, however complicated their profile. There is only one attachment needed and that one is only for grinding carbide inserted-tooth milling cutters. The machine is heavily built, the design and construction resulting in great rigidity. A universal ball-and-socket vise is combined with an inclinable table, and the tool can be clamped in any position. Compound angles are easily read. Constant-clearance angles are obtainable on tools having radii or complicated profiles.

The wheelhead consists of a motor unit carrying a diamond wheel at each end—one for roughing and one for finishing. Each of these may be brought into position as required.

Coolant is sprayed out through holes in the center of the wheels by centrifugal force. Wheels are raised or lowered by two-speed handwheel with sensitive control. A radius setting gage is provided, as well as graduated dials for positioning the tool. Standard equipment also includes a reversible motor with switch, lamp, and splash guards. Imported by:

H.E.B. Machine Tools, Inc., 341 Madison Ave., New York 17, N. Y.

Starcote, a conversion treatment for aluminum and its alloys is said to afford superior corrosion resistance and good organic-coating adherence. Work may be handled in iron containers or racked into the Starcote baths maintained by simple titration. Material may be applied by dipping or by a conventional alkaline washing machine on a production-line basis. Also, the coating may be colored with dyes.

Silver Star Chemical Corp., 58 Watts St., New York 13, N. Y.

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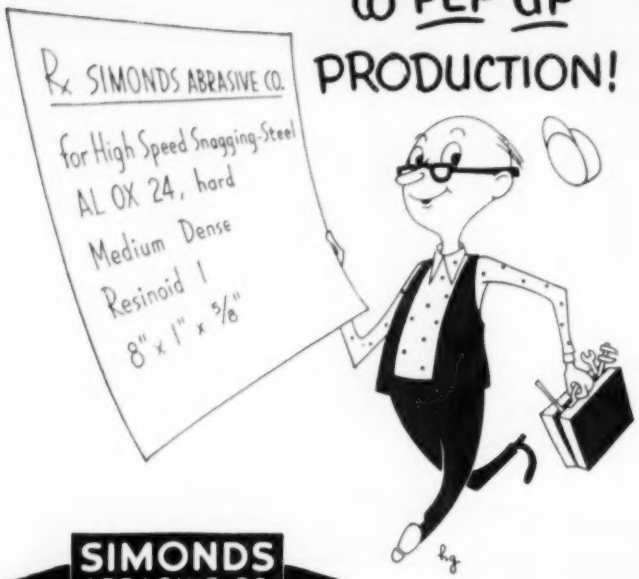

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Simonds Abrasive Borolon wheel, Resinoid bonded for high speed grinding! That's the meaning of *this* prescription . . . an effective one for detouring trouble during grinding operations. Chances are you'll find the right prescription for *your* grinding headaches in our free data book. It lists wheel specifications for all your grinding jobs and gives details on Simonds' complete line, including mounted wheels and points, segments and abrasive grain. Let's send it to you together with the name of your nearby Simonds Abrasive distributor. Write.

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ROUND TABLE Discussion

STUMP SPEECH

What about political-discussion breaks in the shops? Has the greater freedom to talk been abused? Sides taken by our readers—

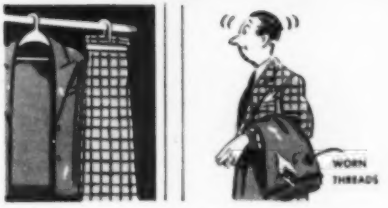
OBVIOUSLY, if political talk is to be allowed in the shop, there must be a limit somewhere. There is an occasional man who will need to be shown that limit, and held to it. A man who gets heated up in discussion until he wastes his own time and that of others to any appreciable degree cannot be allowed to continue. But to be so rigid on a matter of this kind that no man can say a word at any time is also wrong. This is particularly true in cases where management hopes for workers to think sanely and vote accordingly. Let workers get the idea that management is trying to push them around unfairly, in any way whatever, and they will vote for socalled labor candidates regardless of how far short they may be of qualifications for office.

As far as management trying to influence votes of workers is concerned, there is no hope that this can be done unless management is fair with workers in every respect and all the time. Playing Simon Legree for most of the year, then waxing fair and friendly for a period of time prior to election not only fails to deceive anyone, but is an insult to the intelligence of workers. If workers are taken into confidence and given all the facts through the year, it may possibly do some good for the boss to make his own political preferences known. But unless he can do it in such a way as to show that it is for the benefit of his workers to follow his preferences, he will do better to keep them to himself.

Not every company is apparently convinced that it pays to chart its course with the welfare of employees as strongly in view as that of its own. It is well for any employer to make a true diagnosis of his policy in this respect before becoming unduly expansive in seeking political cooperation, or in fact very much true cooperation of any kind. Were all the facts known, it would take a large library to house the records of abortive efforts which have been made along this line.

Al is also correct in saying that men have to blow off a certain

A forgetful young man from Woonsocket,
Missed a big "roll" from his pocket.
He was sure that the cause of his strife
Was a "high-speed tap" by his Wife.

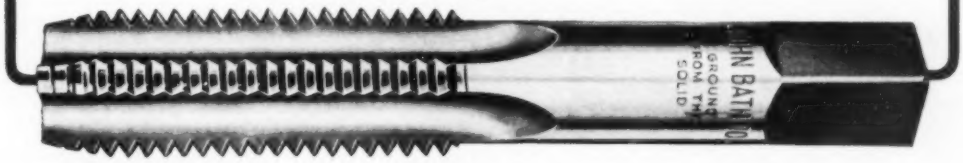


But he found himself due for correction,
He had worn the wrong pants by selection.
An old cast-off pair lost his "roll"—
And "worn threads" caused the "high cost per hole"!

JOHN BATH CO. INC. · WORCESTER · MASS ·

Like the toolroom that's way "out of pocket,"
They buy one style of tap—and stock it.
Use the same one for steel and for plastic.
And the "cost per tapped hole" is fantastic.

Just remember—you'll never go wrong.
With Bath Taps . . . your threads will be strong.
The right tap for each job brings perfection.
May we help you to make your selection?



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Efficient tapping today is more essential than ever, with the many different materials to be threaded. Careless or improper tap selection means increased costs . . . poor results.

Bath engineers can save you money by helping you select the right tap for the job. All that is needed is information about the thread to be cut, the material in use, and the size and tolerances to be maintained.

The type of machine used for tapping can make a big difference. Light tapping should be done on a light, fast machine . . . heavy work on a heavier machine.

Spindle alignment must be accurate, as proper rotation of the tap is a most important machine function. You'll find Bath always ready with suggestions from a wealth of tap experience.

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TORRINGTON NEEDLE BEARINGS

amount of steam when they get together, and that if it were not about politics it would be about something else. Since we must be realistic enough to deal with men as they are, rather than as we wish they were, it is wise to let the boys express themselves, at least up to a point. Just where that point is located will differ in different plants and departments. Where the work is such that the mind can wander without too much damage being done, it may be wise to give a little more leeway than in departments where it is such as to demand that attention be put fully upon the work.

Perhaps a more strategic way for the political preference of management to be made to carry weight is to let the boys talk rather freely, then note which of them (and especially which of the key men) have of themselves arrived at management's position. To quietly mention to such a man or men that you appreciate their foresight and understanding will please them, and probably make them even more staunch in the stand they have already taken. But no man appreciates being dominated. Even if one were able to convince him, it is doubtful whether he would act on his true convictions. Out of the inevitable fact that men resent domination comes the old couplet: "A man convinced against his will is of the same opinion still."

John E. Hyler
Peoria, Ill.

•

SOUR NOTE

PERSONAL AFFAIRS or personal relationships, notably between a responsible executive and another employee coming under that executive's jurisdiction, cannot fail to affect shop relations. Because of the inherent jealousies, envies and contradictions in human nature, any apparent personal friendliness between the foreman and a particular member of the squad invariably affects shop conditions adversely.

The particular snag of being strictly neutral in shop contacts has been one of my constant worries for a period of almost 40 years. In my time I have known so many men in the ranks whom I have liked and respected, with whom I could have enjoyed close personal friendship but for the fact that such friendships would surely have been misunderstood in the shops and would have been, I am convinced, definitely bad for the goodwill which it is a foreman's duty to foster and extend. This should not be mistaken for snobbishness, station-in-life, education, material possessions, etc. The limiting factor as far as a foreman is concerned is that he is expected to be strictly impartial; on that altar he must sacrifice many desires.

No matter how one may feel about it, showing greater friendliness to one rather than another is the cause of much evil conjecture, unfounded suspicion, disturbed harmony. Almost the most pressing demand on a foreman is the insuring of harmony and good teamwork in the shops. When he has achieved that end he is well on the way to being a complete success, in order to achieve that end he must rigorously deny himself the luxury of special shop friendships. No matter how long he may have known a given man, no matter if they grew up from childhood to-

HIT IT SOLID-YYOU JUG HEAD
ME NO SAVVY THE RAMROD- HIM HEAR CLICK IN MACHINE ME CAN'T HEAR-NOW ME HEAR POWWOW GOOD AN' HIM NO HEAR!
I CAN'T HEAR A WORD YOURE SAYIN' SPEAK LOUDER!
WHY DOES ME ALWAYS PICK OUT A NOISY PLACE WHEN AN ARGUMENT COMES UP? IF THAT BEER BARITONE CAN'T MAKE HIM HEAR- I AIN'T GITTA CHANCE
"THE LIONS DIN"

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A real mechanic . . . a born mechanic. To you a job that is "all right" just isn't good enough. You demand perfect workmanship in materials and tools. And you are quick to recognize the work and products of other perfectionists.

Bonney wrenches are the work of such men. That is why mechanics call Bonney wrenches America's finest — unmatched for lightness, strength, balance, and precision.

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For the thousands of jobs where backstand belts can save you time, for the thousands of jobs other coated abrasives do so well, Armour has the answer – there's an Armour coated abrasive to do *your* job right.

Saves 3 out of 5 minutes!

The LeRoi Company in Cleveland, Ohio, switched from set-up wheels to backstand belts in finishing forged paving breaker handles. Finishing time was reduced from 5 minutes 11 seconds to 1 minute 32 seconds – *saving 3 minutes 39 seconds per handle!* Now they know, too, that Armour's coated abrasives cut faster, last longer, and give a better finish.

Belts are only one of the many forms of coated abrasives available to you from Armour. There are more than 30,000 different varieties in grit size, backing, etc. Sheets, rolls, discs, tubes – and specialty sizes to meet your specifications.

Let your industrial supply distributor tell you about this complete Armour line. And ask him for your free copy of the booklet, "Facts about Backstand Belt Grinding and Polishing" – or send the coupon today.

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gether, no matter how good a tradesman the man may be or how otherwise useful, in the interests of good shop atmosphere and because of the impartial treatment which every foreman is expected to give, he can only indulge in special shop friendships at his peril.

Ed should handle this note-signing business by pointing out to his friend, Harry, that it is not for a foreman to get entangled in the intimate personal affairs of the company's men and that in common fairness he, the foreman, cannot depart from the role of impartiality imposed on all executives who control others.

I am assuming from Al's remark "He's coming to you as his oldest friend" that Ed and Harry are on visiting terms, in which case Harry should not have broached the subject to Ed in the shop. Much more sensible had the matter been gone into in the quiet of the home of one or the other. If Ed is satisfied that a friend's position is such as to require assistance, no matter where the friend chanced to work, no one could gainsay Ed the right to render the necessary assistance if he felt so inclined. If the friendship with Harry is a family affair of long standing, valued and respected, that bond should be sufficient guarantee to Ed against "talking in the shops." In those circumstances, embarrassing though the incident might be, Ed would be quite within his rights in lending a hand.

If it is merely a shop friendship, even of long standing, mutual trust and respect, Ed would make a grave mistake to take a hand, even on in-

"Let's eliminate this chasing operation, Benson. Follow me!"

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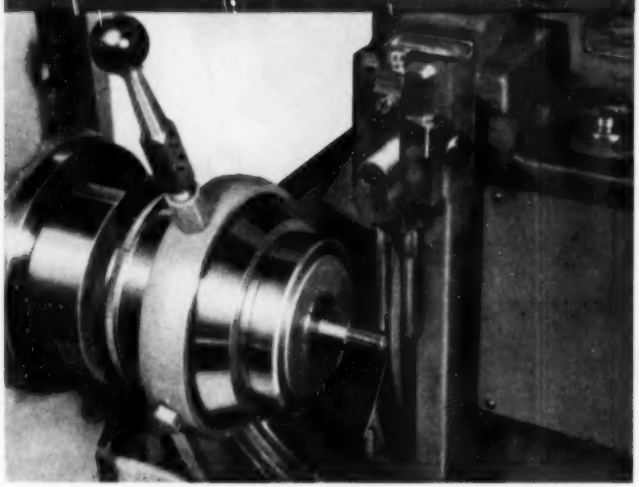

Two inch Levermatic Chuck on a thread grinder. Note length of piece from nose of collet to grinding wheel. Extreme accuracy was still obtained. Eliminated grinding between centers on short pieces. The Levermatic collet chuck is setting a new standard for *instant* internal and external gripping and releasing. For engine, toolroom and turret lathes, millers, drill presses, grinders.

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- Simple Finger-Tip Adjustment
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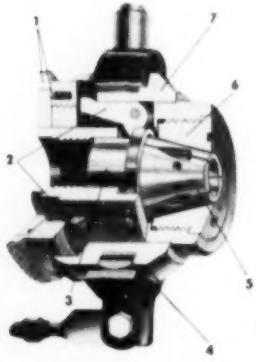

1. Selective pressure adjusting ring with positive ball detent lock.
2. Hardened cam levers (three).
3. Collet pusher sleeve.
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5. The new Co-netic Collet — new parallel grip design.
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7. Positive cam closing collar.

SUTTON TOOL COMPANY
Department AM-4, Sturgis, Michigan

SUTTON TOOLS

vitation, shop friendships should be confined to shop affairs with only a polite, detached interest on the personal side.

C. D. Mackinnon
Lanarkshire, Scotland

•

ALICE IN BLUNDERLAND

A MANAGEMENT-WORKERS grievance committee is not the preserve of the worker alone and Ed is entitled to avail himself of its good offices if he thinks fit. In the bad old days it was a thorn in the flesh of the worker that a boss could always rid himself of labor he could not get on with, while the worker couldn't fire the boss no matter how difficult he might be. Times have now changed and in the democracies today a foreman must have a good reason for discharging a worker. Few fair-minded people will quarrel with that change. Nevertheless, Reynolds would have stood in a better light had he notified Ed of his intentions before going to the committee, since, as Ed holds, the whole matter might have been settled out of "court." There seems to have been faults on both sides, as is to be expected, and in that reflection would seem to lie complete justification for the existence of the grievance committee.

Most new departures in industry are at first abused, especially if they move sharply from long-accepted practice. In the case of the grievance committee, one would normally expect a crop of frivolous complaints to be forthcoming, because to think up a grievance is as easy as shelling peas. That phase should die young if the committee knows its business and puts its official foot down firmly on all flimsy attempts to waste its time. Viewing the credit side of the ledger, a grievance committee has much to recommend it and if happily

"Such screeching! Why didn't someone tell me the company was hiring wimmin again!"

constituted can be an invaluable instrument for good in the shop.

That is my firm conviction after a long executive experience in industry, a long trade-union membership and, in my earlier years, years of service as a shop steward. Myself an old timer, I see in some of the modern conceptions much to be satisfied about and I feel sure that, properly constituted, the grievance committee can be a winner and a timesaver in the broadest sense of the word. Three is the ideal number, one representing the executive side, one representing the non-executive, with an adjudicator not connected with either side. At final deliberations, the parties to the dispute would, of course, be present.

Settlement on the spot of an issue between an operative and a foreman, when feelings of resentment may occupy both minds, can be quite unsatisfactory, especially if the issue seems to impinge on the foreman's authority. An interval for reflection is a great help and that is just what the grievance committee affords. I, personally, have often been sorry for having spoken, seldom indeed have I regretted holding my tongue. If a decision by the committee on a dispute between the foreman and one of the men goes against the foreman he can at least comfort himself with the thought that he is not responsible for it. If it goes against the man he has no cause for resentment against the foreman since it would be a committee decision, representative of both sides and arrived at after a full investigation of all the facts.

C. D. Mackinnon
Lanarkshire, Scotland

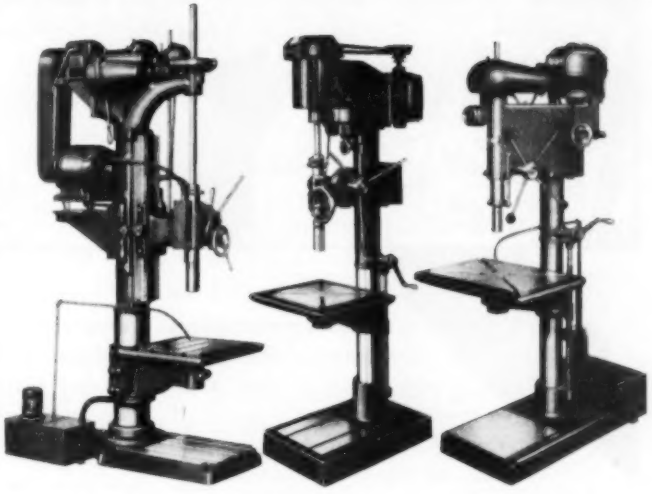
•

POWER OF SUGGESTION

Should supervisors be barred from awards for suggestions for improving their own departments? Is it a sound policy to place restrictions on eligibility for suggestion awards? Does it lead to coercion in some cases? The readers favor—

THE POLICY of barring ideas from supervisors, when the ideas are applicable to their own departments, is sound, in my opinion. In fact, I think it is a policy that should be made the rule in all factory suggestion schemes.

In fairness to the management concerned, a supervisor is appointed and paid a high rate, in order that his full knowledge, experience and ability shall be utilized for the benefit of his own department. The fact that he possesses knowledge and skill



Models D-24, D-28 available in 24″ and 28″ swing; 1¾″ capacity; 3 speed options; geared power feeds; four speed geared transmission; 25″ head travel; 11″ spindle feed.

Model C-20 has 20″ swing; 1″ capacity in mild steel; eight spindle speeds from 65 to 1360 R.P.M.; geared power feeds; automatic spindle stop; 2 H.P. motor; tachometer.

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YUH C'N BET HE'LL BE TEACHER'S PET
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MEchanics Wanted - WHO KNOW THE RIGHT TOOLS FOR THE JOB AND THE RIGHT WAY TO USE THEM
STAN RANDALL

Said a manufacturing executive, "Show me a foreman who's 'bugs' about good tools and good care, and I'll show you a foreman whose production is high and whose tool costs are low."

You'll find that particularly true with regard to files. There are files and files and files! But look-alikes are not always do-alikes. Nicholson laboratory and shop tests are proving that right along.

Nicholson has applied all its eighty-seven years' experience to the manufacture of files—and to making them better and better as new combinations of steel qualities, designs, cutting equipment and hardening and finishing methods have yielded new degrees of perfection.

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above the average level of machinists and the like is the only reason why he ever became a supervisor. In order that the supervisor shall have freedom of action in performing his duties, he is granted freedom of movement within the factory and other small restrictions which are imposed on machinists, in the interests of discipline, are lifted in the case of the supervisor. The supervisor enjoys privileges not shared by lesser individuals and he ought to realize that he cannot have jam on both sides of his bread—he cannot enjoy the better life of the supervisor and expect to share in the extra benefits which are offered to his workmen, in the interests of making them more efficient.

The supervisor is in the same category as the tool designer or methods engineer. Both these individuals are expected to invent, scheme out and evolve mechanical devices which are patentable, in many cases. The law is quite clear about the ownership of patentable devices produced by employees in the course of their normal duties; they are the property of the employer. In the same way, the supervisor is supposed to scheme and put into effect anything which he considers will increase the output or the efficiency of his section. He owes it to his employer. It is a fundamental duty which is embodied in the one word, "loyalty."

The idea of permitting supervisors to submit suggestions for use in departments other than their own is a very wise move. It is basic human failing for us to be able to see the faults of others while remaining

"Forget tolerance; just see that the piece is reasonably round!"

by
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Garrison Gear Chuck Service starts with your gear print and follows through with a complete service for the life of the chuck. Over thirty years of experience in designing and manufacturing pitch line control gear chucks exclusively, has built up a wealth of engineering knowledge. This knowledge is applied to designing the best custom-built gear chucks for solving your gear problems.

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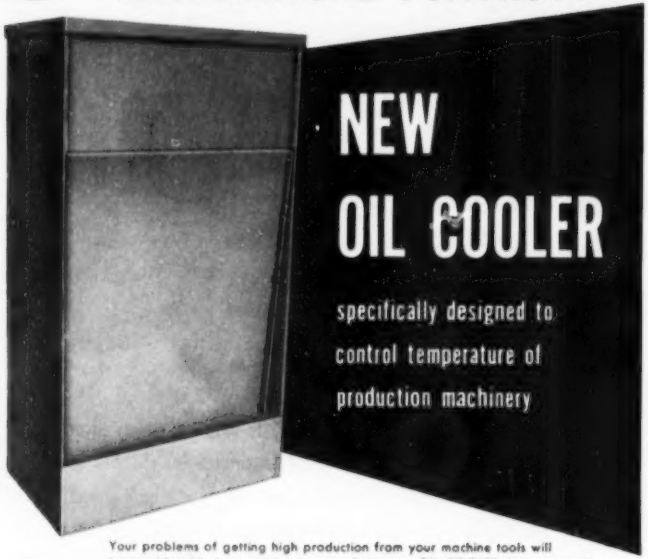

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specifically designed to control temperature of production machinery

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These advantages can result from its use . . .

- Uniform Work Pieces
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- Reduction of Oil Evaporation
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blind to our own. This failing is converted into an asset when it is put to work for the benefit of the whole firm.

If a supervisor is faced with the possibility that some outsider can make suggestions for the improvement of his own department, he will tend to keep a sharp lookout for any failings in his own section which will be apparent to the critical eye of a supervisor from another department. In this way, supervisors are kept on the alert so that outsiders will not have reason to find fault with their organization or methods. A suggestion from a supervisor who does not work in the section can be taken as a criticism of that section, and of its supervisor. Consequently, supervisors will tend to keep their departments above criticism.

One weakness that can be attributed to this placing of restrictions upon supervisors making profitable suggestions for their own departments and which will qualify for cash awards is the possibility of collusion between supervisors (collusion meaning "a secret understanding for fraudulent purpose"). It would be possible for two supervisors to arrange to swap suggestions with each other. Each would suggest an idea for the other's department and both would quality for cash awards. This possibility, however, would not be likely to occur with great frequency and in the long run, the firm would benefit and the overall reason for the existence of the suggestion scheme would be justified.

Clifford T. Bower
London, England

•

ALTHOUGH many companies have restrictions on eligibility for suggestion awards which bar cash to supervisors for their ideas affecting their own departments, the companies still give recognition for the supervisors' thinking. This is done through commendatory letters from the management and publicity through the plant paper. However, it is my opinion that eligibility rules should not bar cash awards to supervisors for ideas benefiting their own departments. The rule governing submission of suggestions by supervisors, that is, foremen and assistant foremen, providing that these supervisors would receive consideration for awards only on suggestions which clearly fall outside their regular line of duty is not a sound one. Why should awards be made to supervisory employees for suggestions affecting savings in other departments only?

(Continued on page 249)

What's in Vermont this month?

NOW, INTERCHANGEABLE GLASS PARTS THROUGH INTERNAL GRINDING. A standard machine tool designed for metalworking was recently put to work in a glass factory. This in itself is not startling, but it illustrates the new and progressive thinking of production men —thinking that is paying off throughout industry.

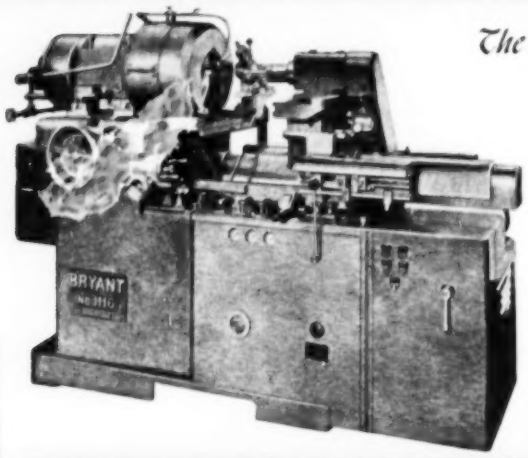
In this glass factory the old operation sequence consisted of rough lapping taper holes on cast iron laps, finish lapping male and female parts together as an assembly, then continuing these two parts through production to be shipped as a unit. Imperfection of one part meant scrapping both parts.

A Bryant No. 1116 internal grinder was put on the line. "As cast" or blown parts are chucked and then ground with a diamond wheel. In a matter of seconds the taper hole is ground so that it will "blue" a plug. The operator checks the piece in the machine and sends the part on. No mating is needed, as all holes are made to a standard and are interchangeable. Actual figures show that the new method is faster and cheaper and, at the same time, the final product is greatly improved because of the interchangeability feature.

This is an example of how well-established metalworking production methods can be applied to other industries. Bryant equipment grinds hole, O.D., and face, singly or in combination, in a single chucking.

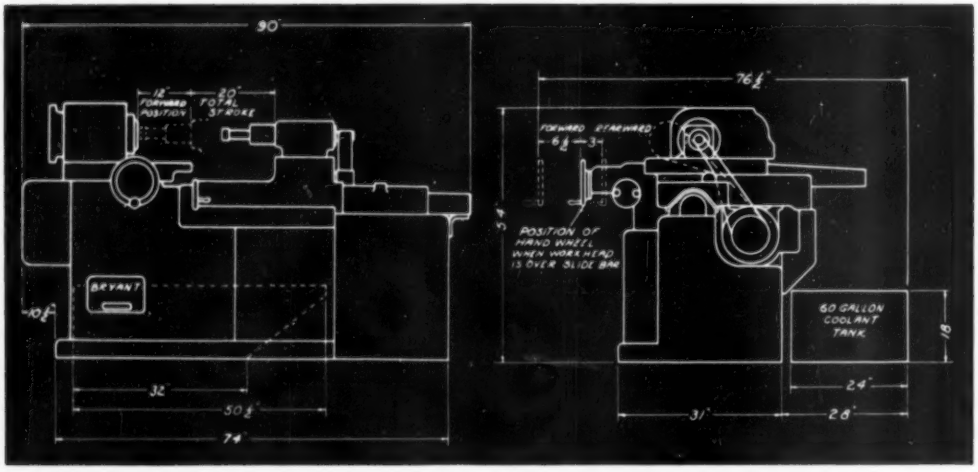
Bryant Chucking Grinder Company in Springfield, Vermont, U.S.A.

FOR HOLE GRINDING

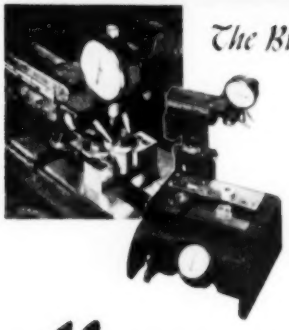


The Bryant 1116 Hydraulic Hole Grinder

This machine is for general purpose hole grinding. It has convenient centralized controls and all features necessary to handle a variety of work with minimum time and effort needed for changing jobs. For stable 3-point support, the wheel spindle is mounted on a cylindrical bar which is supported on 2 cylindrical bearings. The rear of the slide is supported on a hardened and ground guide plate. Workhead may be swiveled for grinding tapers up to 90° included angle. Provision is made for mounting a face grinding spindle in addition to the hole grinding spindle. The No. 1116 will swing 16" with 8" max. hole depth. Write for folder.



FACE SQUARE WITH INTERNAL THREAD

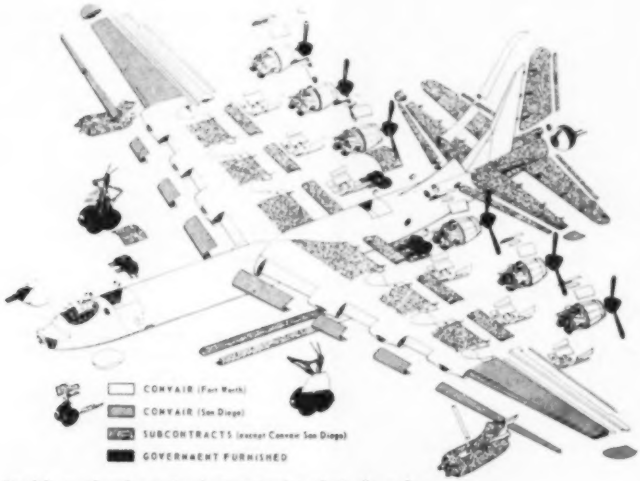


The Bryant Thread Gage with Squareness-of-Face Attachment

When a face must be checked square with an internal thread, the part should be held on the thread flank and rotated in this position. The Bryant Gage does this, regardless of variation in roundness, P.D., lead or thread form. The squareness-of-face indicator is raised by a yoke at a constant rate regardless of face run-out, thus giving a direct and exact reading of squareness with the thread axis. Simultaneous readings can be made — the Bryant Gage checks thread size — the Attachment shows face run-out.

Bryant Thread Gage gives accumulated reading of P.D., form and lead on dial indicator 4 to 5 times faster than plug gaging.

Bryant Chucking Grinder Company in Springfield, Vermont, U.S.A.



Breakdown of major parts of atom-carrying giant, shows how . . . . .

Convair Suppliers Help Build B-36

SAN DIEGO, Calif.—Some 60 subcontractors and 1550 suppliers located in 36 states supplement Consolidated Vultee's San Diego and Fort Worth divisions in producing the B-36 bomber. In the Dallas area alone, Convair's subcontracting runs to $3 million a month.

The Fort Worth division handles assembly of the plane and the bulk of the manufacturing job, substantially the entire fuselage. Excepted are doors, tail cone, horizontal stabilizer, elevator and rudder, inboard wing box beams and piston engine ducting and cowling.

The San Diego division supplies the outboard wing assemblies, the wing leading edges and other parts. Some 68,000 parts of the plane are Convair made.

Besides thousands of parts furnished by the 1600 sub-contractors and suppliers, hundreds of parts are government-supplied. These include engines, instruments, and the like.

Mobile Navy-Ordnance Exhibit To Tour Country This Summer

WASHINGTON—A mobile procurement exhibit of Navy Ordnance will start a 48-state tour late this month to aid small firms interested in obtaining Navy contracts. On display will be unclassified ordnance material suitable for manufacture by small firms. Itinerary of the exhibit will be announced later.

Pratt & Whitney Completes Tests of New Navy Jet Engine

E. HARTFORD, Conn.—Pratt & Whitney Aircraft Co. has announced completion of initial tests for the Navy on a new jet engine, an advanced J-48 Turbo-Wasp.

This new engine uses a new heat-resistant alloy which contributes materially to increased performance and saves substantially on critical metals now in short supply.

Contract for Guided-Missile Ship

WASHINGTON — The New York Shipbuilding Corp., Camden, N. J., has been awarded a conract for converting two heavy cruisers (the 13,000 ton USS Boston and USS Canberra) into guided missile ships. Total value of the contract is approximately $30 million exclusive of design work and centrally procured material.

To Place Military Contracts in Labor Surplus Areas

WASHINGTON — Military procurement officers now have instructions to place contracts in excess of $25,000 with manufacturers in labor surplus areas, where possible.

New regulations were issued last month by the Munitions Board and the Armed Services Procurement Regulation Conference that spell out the procedure for military buyers. Actually, the new regulations do not change the Armed Services Procurement Regulations—the procurement bible—but point out how the defense contracts can help in labor surplus areas and still stay within instructions.

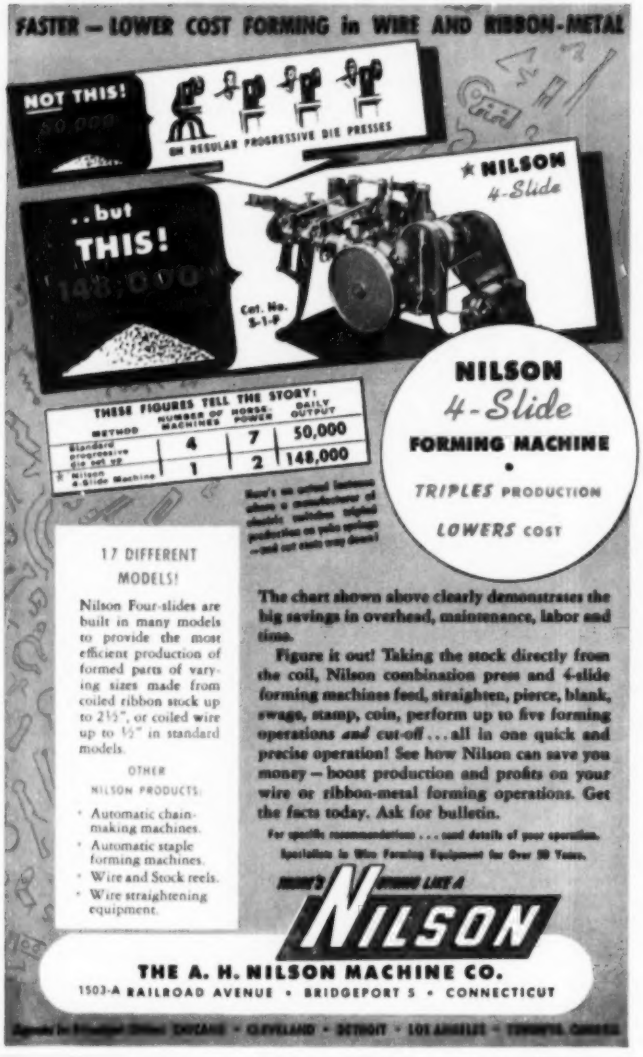
• **Procedure for negotiated contracts** is simple. A procurement officer invites proposals from manufacturers for an item. If the lowest bidder is not in a labor surplus area, the procurement officer can turn to the firm submitting the lowest proposal from the distressed area. If the bidder is otherwise acceptable, he gets the contract.

The procurement officer is allowed to reveal the amount of the lowest bid, but not the bidder or cost information. The idea behind this being that he should work to get the best possible terms in the negotiation.

Late bidders under negotiations can be considered also, provided they are in labor surplus areas. However, if their proposals are received after final negotiations are undertaken, they will not be considered.

• **Advertised procurements** are still conducted in the same manner as before. However, the procurement officers can make "set asides" and solicit proposals from firms in labor surplus areas. These can also be partial "set asides." That is, the procurement officer can divide up a contract to get the quantity which

(*Continued on page 240*)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NOT THIS!
$0,000
ON REGULAR PROGRESSIVE DIE PRESSES
..but
THIS!
148,000
★ NILSON
4-Slide
Cat. No. S-1-P
THESE FIGURES TELL THE STORY:
METHOD | NUMBER OF MACHINES | HORSE-POWER | DAILY OUTPUT
Standard progressive die set up | 4 | 7 | 50,000
★ Nilson 4-Slide Machine | 1 | 2 | 148,000
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17 DIFFERENT MODELS!
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The chart shown above clearly demonstrates the big savings in overhead, maintenance, labor and time.
Figure it out! Taking the stock directly from the coil, Nilson combination press and 4-slide forming machines feed, straighten, pierce, blank, swage, stamp, coin, perform up to five forming operations and cut-off . . . all in one quick and precise operation! See how Nilson can save you money — boost production and profits on your wire or ribbon-metal forming operations. Get the facts today. Ask for bulletin.
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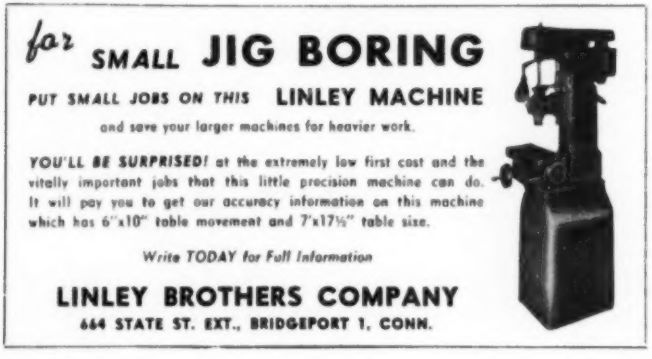
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subcontracting NEWS

DISTRESSED AREAS . . . . . continued

would probably yield the most favorable price. He then advertises for bids for this quantity and holds the remainder for negotiation for production in a labor surplus area.

The new instructions require that procurement people check qualified bidders lists to make sure that firms in labor surplus areas get invitations to bid under both advertised and negotiated procurements.

If the placing of contracts in distressed areas follows the pattern already set by defense contracting, then the majority of actions will be through negotiation. Department of Defense figures show that 93% of all contracts were negotiated during fiscal year 1951.

Solar Aircraft Delivering Jet Parts on Packard Subcontract

DES MOINES, Iowa—Solar Aircraft Co.'s new Wakonda plant here, went into production in mid-March and was to begin deliveries of jet-engine parts by the end of the month.

The 300,000-sq ft plant, built and equipped at a cost of $7 million, will turn out parts for the J47 turbojet, power plant of the B-47 Boeing Stratojet. Solar is building the components as part of an $8-million order from Packard Motor Car Co. Parts for the Allison J33, J35 and J71 engines also will be turned out at the new plant, which about doubles Solar's production capacity in Des Moines. The firms other plant is at San Diego, Calif.

Solar is also doing subcontract work for most of the airframe companies on the West Coast.

Pioneer Air Lines Awards TEMCO $½ Million Modification Contract

DALLAS, Texas—Texas Engineering & Mfg. Co. has been awarded a $½-million contract by Pioneer Air Lines to modify nine twin-engine Martin transport for local service operations.

The aircraft will be modified by TEMCO's Greenville Division at Majors Field, Greenville, Texas. The division is a major center for the overhaul and reconditioning of C-54 transport for the Air Force. Work on commercial planes will start immediately.

Willys Gets Largest Jeep Contract Since World War II: $149 Million

TOLEDO, Ohio — Willys-Overland Motors, Inc., has received an order for $149 million worth of military jeeps, the largest defense contract issued the company since World War II.

The contract is the sixth major one awarded Willys since 1949 and is about three times as large as any post-war order previously received from Army Ordnance.

Willys will increase its daily output of jeeps by 50% to expedite delivery of the vehicles. The latest jeeps will be waterproofed and contain Willy's new F-head engine.

Douglas Lets Two Subcontracts Totaling $5 Million

SANTA MONICA, Calif.—Douglas Aircraft has awarded two subcontracts totaling some $5 million to Weber Showcase and Fixture Co., Los Angeles, and its subsidiary, Weber Aircraft Corp.

One contract is for manufacture of all the doors for the C-124 Globemaster, heavy-duty Air Force transport. The other is for production of complete engine assemblies for AD-4 and AD-5 Skyraiders, Navy attack planes.

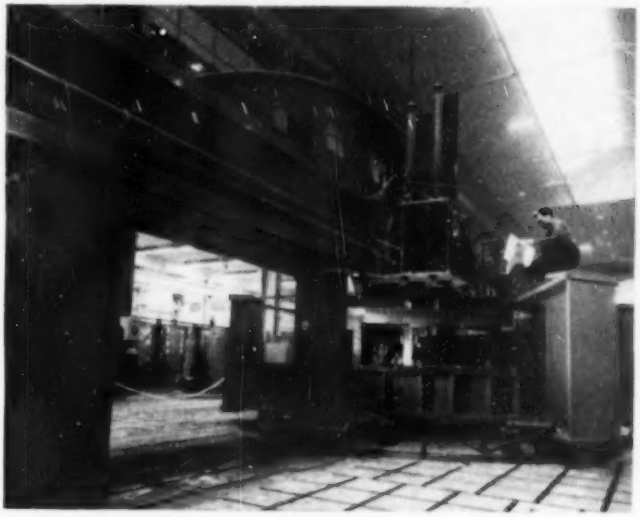
Firm subcontracts awarded by Douglas now total approximately $47 million. Letters of intent, with expenditure limitations totaling $42 million, also have been issued for major aircraft sub-assemblies.

Ryan Development Contracts Boost Backlog $4 Million

SAN DIEGO, Calif.—Undelivered contracts of Ryan Aeronautical Corp., which totalled some $41 million by the end of 1951, fiscal year, have since risen an additional $4 million.

The company has a number of Air Force and Navy prime research and development contracts, including a jet-propulsion research program for the Navy, the Ryan XQ-2 jet-propelled pilotless target planes, and is doing electronics development work for both branches.

Ryan is also expanding its work in the rocket power-plant field, manufacturing complete rocket motors of a type developed by the jet-propulsion laboratory of the California Institute of Technology.



Vertical boring mill machines huge hydro-generator frames and bearing-bracket assemblies with watch-like precision at General Electric's Schenectady plant. The over-all boring unit will handle pieces up to 42 ft in dia. Construction of the mill is such that the work can rotate on the table or stay fixed while a cutter assembly rotates inside the piece. Over-all weight of the base alone is 1134 ton. Some 100 ton of steel went into the mill foundation

LATEST DEFENSE CONTRACTS

ARMY ORDNANCE AWARDS

Tank-Automotive Centre, Detroit

Timken Roller Bearing Co., Canton, Ohio—hardware replenishment, $127,294.

Supreme Equipment Co., Cleveland—tool replenishment, $228,000.

Chevrolet Motor Div., GMC, Detroit—motor-vehicle parts, $252,201.

Goodyear Tire & Rubber Co., Akron, Ohio—hardware replenishment, $142,749.

Tyson Bearing Corp., Massillon, Ohio—hardware replenishment, $153,084.

Clayton Mfg. Co., El Monte, Calif.—tool replenishment, $713,825.

Detroit Ordnance District

Vickers, Inc., Detroit—spare parts, accessories and tools, fire-control, $456,933.

Central Specialties King-Seeley Corp., Div., Ypsilanti, Mich.—metal parts, $842,817.

Motor Wheel Corp., Lansing, Mich.—metal parts for 60-mm shells, $1,134,840.

Hart & Cooley Mfg. Co., Holland Mich.—HE shells 60-mm mortar, $1,150,036, and production facilities, $546,372.

Evans Products Co., Plymouth, Mich.—tripod mounts, spare parts, exceeds $250,000.

Reo Motors, Inc., Lansing, Mich.—2½ ton trucks, spare parts, exceeds $250,000.

Rochester Ordnance District

Fedders-Quigan Corp., Buffalo, N. Y.—cartridge cases, 105-mm, exceeds $250,000.

Fibre Forming Corp., Olean, N. Y.—hand grenades, $174,945.

Rochester Products Div., GMC, Rochester, N. Y.—percussion primers, exceeds $250,000.

Philadelphia Ordnance District

American Car & Foundry Co., New York—guns, twin 40-mm, spare parts, exceeds $250,000. Deep-water fording kit, exceeds $250,000. Motor carriage, 105-mm howitzer exceeds $250,000 on two contracts.

Lehigh Foundries, Inc., Easton, Pa.—HE shell, 105-mm, exceeds $250,000.

York Electric & Machine Co., York, Pa.—facilities, $175,951. 75-mm chemical shells, exceeds $250,000.

Karl Lieberknecht, Inc., Reading, Pa.—57-mm shells HE, exceeds $250,000, production facilities, $218,075.

Kennedy Van Saun Mfg. & Eng. Co., Danville, Pa.—rocket heads, exceeds $250,000.

Cincinnati Ordnance District

Perfect Circle Corp., Hagertown, Ind.—facilities, exceeds $250,000.

Wheland Co., Chattanooga, Tenn.—90-mm guns, spare tools, spare parts, exceeds $250,000.

Cleveland Ordnance District

Willys-Overland Motors, Inc., Toledo, Ohio—combat-vehicle parts, exceeds $250,000.

Buckeye Aluminum Co., Wooster, Ohio—arming plug, exceeds $250,000.

Firestone Tire & Rubber Co., Akron, Ohio—accessories, tools and equipment, $129,416.

Pittsburgh Ordnance District

National Tube Div., U.S. Steel Co., Pittsburgh—shell, 90-mm, exceeds $250,000. Rocket heads, exceeds $250,000. Rocket-motor assemblies, exceeds $250,000.

(Continued on page 244)

Ammunition racks for Army
Hundreds of special parts for mobile units
Dynamometer checking cabinets for Navy
Instrument panels for Army
Spare parts boxes for gyroscopes
Foot lockers for Army
Light cases for Signal Corps
EXAMPLES OF LYON SPECIAL PRODUCTION DURING WORLD WAR II
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Bomb fin cases for Ordnance
Communication unit for Signal Corps
Ammunition racks for tanks
Electronic repair kit for Navy
Ammunition box for Navy
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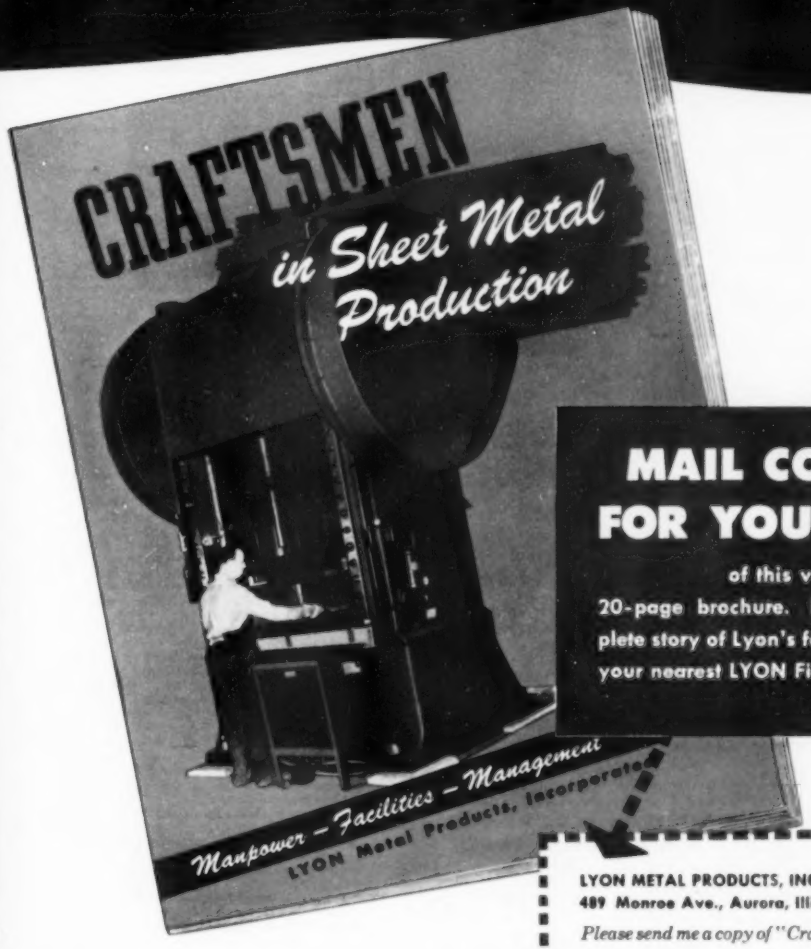

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MODEL A-312-H

The Hartford Special Model A-190 Automatic Thread Roller has now been on the market for more than three years. During this time it has met with universal satisfaction from its many users, and this favorable reception and experience by the trade has naturally influenced us to design and develop a larger capacity machine.

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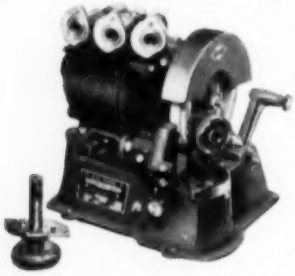
SAVE—50% & more on Grinding Small Drills. SAVE on Drilling Time. SAVE by Reducing Work Spoilage. SAVE in Every Use of Small Drills.



This motor-driven machine cuts grinding and drilling costs 50% and more, saves expensive drill stock, reduces work spoilage and drill breakage.

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BLACK DIAMOND
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DEFENSE AWARDS . . . . . continued

Springfield Armory, Mass.

Quality Hardware & Machine Co., Chicago—assembly machine for 45-cal. pistols, exceeds $250,000.

Wallace Barnes Co., Associated Spring Corp., Bristol, Conn.—cartridge clips, $145,326.

L. E. Zarbach Steel Co., Somerville, Mass.—cartridge clips, $122,390.

Colt's Mfg. Co., Hartford, Conn. — 45-cal. pistol parts, $113,990.

Commonwealth Plastics Corp., Leominster, Mass.—45-cal. pistol disconnectors, exceeds $250,000.

Bethlehem Steel Co., Bethlehem, Pa.—barrel blanks, $214,360.

Watervliet Arsenal, N. Y.

General Slicing Machine Co., Walden, N. Y.—extension sights, $111,750.

General Tire & Rubber Co., Akron, Ohio—muzzle brakes, $233,748.

H. A. Smith Machinery Co., Syracuse, N. Y.—Sundstrand milling machines, $186,314.

ARMY SIGNAL CORPS AWARDS

Philadelphia Supply Agency

Federal Telephone & Radio Corp., Clifton, N. J.—power supplies, exceeds $250,000.

Barker & Williamson Inc., Upper Darby, Pa.—radio sets, exceeds $250,000.

Leeds & Northrup Co., Philadelphia—radiosonde recorder, exceeds $250,000.

Cornell-Dubilier Electric Corp., South Plainfield, N. J.—power supply, exceeds $250,000.

Pilot Radio Corp., Long Island City, N. Y.—power supplies, $214,545.

Webster-Chicago Corp., Chicago — sound-reproducing sets, $160,757.

RCA-Victor Div., Radio Corp. of America, Camden—tabulator, maintenance parts, $230,-807.

Teletype Corp., Chicago—teletype parts, $108,302.

Rauland-Borg Corp., Chicago—power supply, exceeds $250,000.

Molded Insulation Co., Philadelphia—Radiosonde, exceeds $250,000.

Fada Radio & Electric Co., Belleville, N. J.—power supply, $240,000.

American Television and Radio Co., St. Paul, Minn.—power supplies, exceeds $250,000.

Stewart-Warner Electric Div., Chicago—receiver-transmitter, exceeds $250,000.

Coro, Inc., Providence, R. I.—chest sets, $210,451.

Connecticut Telephone & Electric Corp., Meriden, Conn.—maintenance parts, exceeds $250,000.

Stromberg-Carlson Co., Rochester, N. Y.—switchboards, exceeds $250,000.

Best Mfg. Co., Inc., Irvington, N. J.—head sets, exceeds $250,000.

Allied Distributors, Philadelphia—tool equipment, $106,404.

Reeves Instrument Corp., New York—computers, $129,245.

Jos. J. Bredemann, Chicago—tool equipment, exceeds $250,000.

Video Products Corp., Red Bank, N. J.—RF tuners, exceeds $250,000.

Warwick Mfg. Corp., Chicago—generators, exceeds $250,000.

Datom Industries, Inc., New York—loading coil, exceeds $250,000.

U. S. Rubber Co., New York—telephone loading-coil assembly, exceeds $250,000.

Sun Electric Corp., Chicago—electrical indicating instruments, $173,166.

A.R.F. Products, Inc., River Forest, Ill.—signal generators, exceeds $250,000.

Aircraft Radio Corp., Boonton, N. J.—loop antenna kits, exceeds $250,000.

Precision Associates, Brooklyn, N. Y. — antenna equipment, exceeds $250,000.

subcontracting NEWS

NAVY AWARDS

Navy Purchasing Office Washington 25, D.C.

Pratt & Whitney Div., Niles-Bement-Pond Co., W. Hartford, Conn.—jig-boring machines, $177,704.

Reed-Prentice Corp., Worcester, Mass.—motor-driven lathes, $138,873.

J. H. Elliot Co., Washington—milling machines, exceeds $250,000.

Century Tool Co., Palmyra, N. J.—tool sets, exceeds $250,000.

King Machine Tool Div., American Steel Foundries, Cincinnati — vertical boring and turning machines, $105,510.

Berg, Gibson Mfg. Co., Kansas City, Mo.—battery chargers, $222,213.

National Broach and Machine Co., Detroit—internal gear shavers, $137,606.

Bureau of Ordnance, Washington 25, D.C.

Northern Ordnance, Inc., Minneapolis, Minn.—plant equipment, figure not available.

Robertshaw - Fulton Controls Co., Greensburgh, Pa.—machine tools and production equipment, figure not available.

Ford Instrument Co., Long Island City, N. Y.—synchros, figure not available.

Continental Can Co., Inc., New York—fuse containers, figure not available.

Rheem Mfg. Co., Washington, D. C.—torpedo warheads, figure not available.

New Britain Machine Co., New Britain, Conn.—sleeve and inserts, figure not available.

Robertson Sign Co., Springfield, Ohio—fuse containers, figure not available.

Bay State Steel Co., Wilmington, Mass.—fuse containers, figure not available.

Boehm Pressed Steel Co., Cleveland—machine tools and accessories—figure not available.

General Products Corp., Union Springs, N. Y.—electrical connectors, figure not available.

Navy Purchasing Office, Norfolk

Automatic Washer Co., Newton, Iowa—cartridge cases, exceeds $250,000.

Chain Belt Co., Milwaukee—howitzer tubes, 105mm, $167,268.

Harper Wyman Co., Chicago—percussion primers, $191,553.

Langson Mfg. Co., Chicago—percussion primers, $171,205.

Deere Mfg. Co., Moline, Ill.—HE shells, 155-mm, exceeds $250,000.

Madison Chip Corp., Madison Wis.—tail assemblies, 81mm, exceeds $250,000.

Bureau of Ships, Washington 25, D.C.

Babcock & Wilcox Co., New York—economizer assemblies, $185,156.

Ingalls Shipbuilding Corp., Pascagoula, Miss.—landing ships, dock, $63,076,000.

Buffalo Forge Co., Washington—vaneaxial fans, $175,490.

National Steel & Shipbuilding Corp., San Diego, Calif.—diesel harbor tug, $954,000.

Rosmer Boat Co., Holland, Mich.—diesel harbor tug, $991,200.

DeLaval Steam Turbine Co., Trenton, N. J.—turbo supercharger and spare parts, development, $165,850.

Victor Electronics Co., Los Angeles, Calif.—adapter pits, $127,129.

West Coast Machinery Inc., Stockton, Calif.—deck-cargo barges, $1,152,000.

Kargard Boat & Engine Co., Marinette, Wis.—deck-cargo barges, $1,799,400.

Pidgeon Thomas Iron Co., Memphis, Tenn.—deck-cargo barge, $620,363.

(Continued on page 246)

TUF-FLEX
"TUF-FLEX"® HAND BLADE — the super-tough, super-flexible blade made of a patented special alloy steel. Greatest of all general purpose hand saws.
BLU-FLEX
"BLU-FLEX"® HAND BLADE — the remarkable new, flexible, high-speed blade. Unbreakable in use. Most economical blade ever made for hand sawing hard alloy steels.
BLU-MOL
"BLU-MOL"® POWER BLADE — the high-speed blade that is making industrial hacksawing history. Unequalled by any other metalcutting blade for general, all purpose power hacksawing.
JET-EDGE
"JET-EDGE"® POWER BLADE — the sensational new, high-speed, welded-edge blade. Unbreakable and shatterproof even under toughest cutting conditions.
BAND SAWS — sizes and types for every use. In coils or pre-welded to fit any make and model of machine. Each blade individually boxed and clearly marked for easy handling and identification.
"BLU-MOL"® HOLE SAWS — the new, high-speed, welded edge, hole saw for cutting large holes quickly and efficiently in any machinable material. Follow-through pattern. 40 sizes from 9/16" to 4 1/2".

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SINCE 1868
The Mark of Superiority

NAVY AWARDS . . . . . continued

Griest Mfg. Co., New Haven, Conn.—radio transmitter transfer, $360,596.

Federal Television Co., New York—radio transmitter switchboards, $329,922.

Vokar Corp., Dexter, Mich.—radio transmitter switchboards, $416,910.

National Steel and Shipbuilding Corp., San Diego, Calif.—cargo boats, $909,600.

Higgins Inc., New Orleans—cargo boats, $3,770,720. Harbor tugs, $2,896,325.

National Steel & Shipbuilding Corp., San Diego Calif.—harbor tugs, diesel, $5,626,700.

John E. Matton & Son, Waterford, N. Y.—harbor tugs, diesel, $824,950.

Ferracute Machine Co., Bridgeton, N. J.—minesweeping cutter, $133,102.

Westinghouse Electric Corp., Washington,—vaneaxial fans, $243,668, on two contracts.

Eastern Electric, Inc., New Bedford, Mass.—radio transmitter switchboards, $587,750.

Naval Construction Battalion Center, Porthueneme, California

Construction Machinery Co., Waterloo, Iowa—concrete mixers, $100,172.

Victor Products Corp., Hagertown, Md.—refrigerator units, $364,480.

Butler Mfg. Co., Kansas City—rigid-frame building, $808,740.

Steelcraft Mfg. Co., Rossmoyne, Ohio—prefab buildings, $1,569,461.

Stran Steel Div., Great Lakes Steel Corp., Detroit—prefab building, metal, $6,505,499.

Ships Parts Control Center Mechanicsburg, Pa.

Hall Scott Motor ACF-Brill Motors Co., Div., Philadelphia—repair parts, gasoline engine, $803,089.

Carrier Corp., Syracuse, N. Y.—repair parts, refrigeration, $232,202.

Grove Control's Inc., Emeryville, Calif.—high-pressure reducing and regulating valves, repair parts, $141,338.

Dravo Corp., Philadelphia — repair parts, turbine and reduction gear, $164,220.

Baldwin-Lima-Hamilton Corp., Hamilton, Ohio—repair parts, diesel-engine, $220,156.

Sperry Gyroscope Div., Sperry Corp., Great Neck, L. I., N. Y.—repair parts, gyro compasses, $160,887.

Enterprise Div., General Metals Corp., San Francisco—repair parts, diesel-engine, $136,-129.

NAVAL AVIATION AWARDS

Aviation Supply Office, Philadelphia

Telephonics Corp., Huntington, L. I., N. Y.—microphone assemblies, $175,676.

Thompson Products, Inc., Cleveland—aircraft pumps, exceeds $250,000.

Pratt & Whitney United Aircraft Corp., Aircraft Div., East Hartford, Conn. — engine spares, miscellaneous parts, spare parts, overhaul parts, tools, jet engine tools, exceeds $250,000 on 26 contracts in varied amounts.

Hamilton Standard Div., United Aircraft Corp., East Hartford, Conn.—propeller spare parts, propeller tools and maintenance parts, exceeds $250,000 on nine contracts in varied amounts.

Bureau of Aeronautics, Washington 25, D.C.

Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.—vertical gyro, $2,540,492.

Eclipse Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.—generators, $696,740.

Bueschcr Band Instrument Co., Elkhart, Ind.—altimeters, $360,554.

AIR FORCE AWARDS

Air Materiel Command, Wright-Patterson AF Base, Dayton

Phaostron Co., So. Pasadena, Calif. — switches, $117,544.

Continental Can Co., Coffeyville, Kan. — $105,241.

B. F. Goodrich Co., Troy, Ohio—machinery and equipment, $200,000.

Republic Aviation Corp., Farmingdale, L. I., N. Y. — airplanes, $1,600,000. Components, $500,000.

Taylor Forge & Pipe Works, Chicago—engine rings, $550,000.

Chrysler Motor Co., Los Angeles, Calif.—wing flaps, $587,000.

Utica Drop Forge & Tool Co., Utica, N. Y.—blades $1,302,000.

Ford Motor Co., Dearborn, Mich.—engines, $20,000,000.

Airborne Instruments Labs., Inc., Mineola, N. Y.—indicator kits, $500,000.

Interstate Engineering Corp., El Segundo, Calif.—assembly, washer, $345,201.

William Bayley Co., Springfield, Ohio—Bomb shackle, $386,577.

Jack & Heintz, Inc., Cleveland—actuator assemblies, $322,076. Starters, $248,668. Inverters, $143,364.

Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.—transformers, $382,865.

Aro Equipment Corp., Bryan, Ohio—pneumatic wrenches, $197,500.

Cribben & Sexton Co., Chicago—insert assemblies, $118,000.

Westinghouse Electric Corp., Dayton—generators, $596,204.

Fletcher Aviation Corp., Pasadena, Calif.—tank assemblies, $3,331,250.

Patushin Aviation Corp., Los Angeles—tank assemblies, $1,375,000.

Kollsman Instrument Corp., Elmhurst, N. Y.—machmeters, spare parts, $100,000.

Borg-Warner Corp., Muncie, Ind.—machinery and equipment, $1,000,000.

Romec Div., Lear, Inc., Elyria Ohio—water-injection pumps, $117,118.

Pyrene Mfg. Co., Newark, N. J.—fire extinguishers, $276,000.

Cincinnati Milling & Grinding Machine Co., Inc., Cincinnati—milling machines, $443,754.

Airesearch Mfg. Co., Los Angeles—spare parts, $151,854.

Hartman Elec. Mfg. Co., Mansfield, Ohio—electrical cut-outs, $199,217.

Rauland-Borg Corp., Chicago — amplifiers, $141,120.

Continental Mfg. Co., Harrisonville, Mo.—check assemblies, $313,600.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teteboro, N. J.—indicators, $484,507 and $310,681.

Universal Electric Corp., Owosso, Mich.—machinery and equipment $175,000.

California Eastern Airways, Inc., Oakland, Calif.—kits, modification, $1,453,013.

Beech Aircraft Corp., Wichita, Kansas—aircraft, $1,000,000.

Boeing Airplane Co., Seattle, Wash.—kits, $250,260.

Radioplane Co., Van Nuys, Calif.—target aircraft, $4,543,500.

Leland Electric Co., Dayton — inverters, $280,288 and $129,621.

Eclipse-Pioneer Div., Bendix Aviation Co., Teterboro, N. J.—indicators, $124,763.

Holley Carburetor Co., Detroit—miscellaneous parts, $281,976.

Sun Electric Corp., Chicago — generators, $127,259.

General Electric Co., Schenectady, N. Y.—spare parts, $2,848,818. Generators, $140,597.

Bachman Wholesale Co., Rochester, N. Y.—gun chargers, $105,105.

Diecraft Products, T.L.G. Electric Corp., Div., New York—accesaories, $108,676.

Phaostron Co., South Pasadena, Calif.—generators, $305,893.

S. Buchsbaum & Co., Chicago—containers, $1,041,250.

Bueschcr Band Instrument Co., Elkhart, Ind.—altimeters, $750,000.

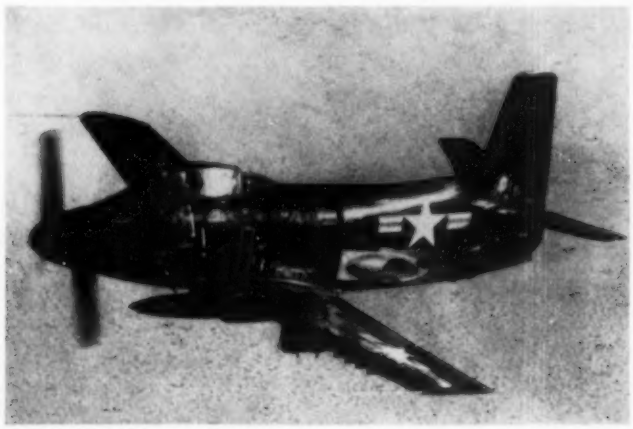
Kollsman Instrument Corp., Elmhurst, N. Y.—machmeters, $170,717.

Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.—pressuretrols, $142,533.

Ryan Industries, Inc., Detroit—indicators, $1,075,265.

General Electric Co., Schenectady, N. Y.—generators, $140,597.

Loewy Construction Co. Inc., New York—forming presses, $20,258,137.



Navy attack bomber, the Douglas A2D, first U. S. bomber to be powered by a turbine-propeller engine, is now undergoing advanced flight testing. Made at Douglas' El Segundo Div., the plane is capable of fighter-plane performance. Two jet turbines, housed as a single unit drive a six-bladed counter-rotating propeller. Exhaust openings aft of the wing give added jet thrust

REGULAR TAPS — SPECIAL TAPS, big ones — little ones, precision ground thread — carbon cut thread, specially heat treated — chrome plated, that's the GTD GREENFIELD LINE.

At "Greenfield" no tapping job is too small, no tapping job is too large, we welcome them all. Go for the **complete** tap line. Go for GTD GREENFIELD.

GREENFIELD TAP and DIE CORPORATION

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Hammer Forged

Steel makers appreciate the importance of hammer-forging in the refinement of steel and that's why it's universally used from ingot to billet in the making of the higher grades of tool steel.

Hammer-forged GTD-AMPCO drills carry ... process further to the highest possible refinement ob... high-speed steel. And, as a fitting climax to HAMMER... GTD-AMPCO drills are polished in the flutes, insuring free chip ... is so essential in drilling deep holes, cast iron and non-... For the best, insist on GTD-AMPCO hammer-forged drills.

AMPCO TWIST DRILL DIVISION

GREENFIELD TAP AND DIE CORPORATION

Greenfield, Massachusetts

I fail to see the logic behind this ruling.

Foremen are employees of the company as well as the rank and file shop men. A restrictive ruling barring awards to supervisors for ideas effecting savings in their own departments won't encourage foremen to submit ideas and suggestions for improvement in methods and work if they have to think first about being eligible to submit suggestions.

Of course it may be argued that ideas for improvements in work are part of the foreman's job, and monetary awards for accepted suggestions should not be made to employees who are employed for the express purpose of developing new methods, new ideas, and processes, or whose suggestions or ideas arise from or have a direct bearing on the work they are specifically employed to do, or from their fields of activity. However, such employees should be encouraged by management to submit suggestions for improvement. If the rules prohibit monetary rewards for acceptable ideas, then management should see to it that official recognition is given to such suggestors and such commendations considered in promotion procedure.

It is my opinion that there should be no restrictions on eligibility for submitting suggestions for improvements nor should any bar be laid down for award of cash payment for acceptable ideas from supervisors. The company should want ideas, and a man's position should not disqualify him from receiving an award. Supervisory employees should be given awards based on suggestions effecting savings in their own departments as well as other departments. They should be given recognition for their thinking and initiative in getting good ideas across to the attention of management irrespective of department affected. Suggestions should be considered for award if

"Who's responsible for this?"

"We should have been more careful where we left our Allison Abrasive Wheel"

We'll agree this is rather an unusual application, but it goes to prove one thing. When you have a tough cutting job to do, the best way to do it is by abrasive cutting . . . with Allison Wheels. For instance, if you're cutting steel, glass, non-ferrous metals or ceramics . . . tube, rod, bar stock, or shapes . . . and regardless of whether it's by the wet or dry method . . . you'll find that Allison Wheels will cut at high speeds, accurately to a few thousandths.

For details about the efficient, economical abrasive cutting method . . . information on Allison Wheels and their selection . . . send coupon for a copy of the NEW Allison Catalog.

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ABRASIVE CUTTING WHEELS

THE TOUGHER THE CUTTING JOB . . . THE BETTER THE OPPORTUNITY FOR

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256 Island Brook Ave., Bridgeport 8, Conn.

Gentlemen: Please send me a copy of your new catalog.

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Whether you're in Fort Wayne or Fort Worth . . . Seattle or Syracuse . . . there's a Wendt-Sonis distributor close at hand to give you prompt, efficient carbide tool service. Your W-S distributor is always ready to help you.

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BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • SPECIAL TOOLS

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NEW WENDT-SONIS CATALOG No. 52

72 pages . . . Illustrations and specifications on the most complete line of carbide cutting tools. Send for your copy today.

Write Wendt-Sonis Company, Hannibal, Missouri.

they call attention to a need for changes and improvements in working conditions, production methods, quality of product, elimination of waste, improved design, rearrangement of equipment, and safety, irrespective of what department is involved. Unlimited eligibility to submit suggestions via the suggestion blank is a good take-off for ideas from foremen to get to the attention of top management.

There are too many cases of a "poor relations" attitude toward foremen by management. The foreman represents management to the workers and he should be made to feel that he is an integral part of management. He should be encouraged to submit ideas for improvements and should encourage such activity among his own men. His advice and suggestions should be sought by management and acceptable ideas rewarded by monetary means. It is too often unfortunately true that the only way a foreman can bring some of his ideas to the attention of management is through the medium of a suggestion blank.

Harry Kaufman
Philadelphia, Pa.

•

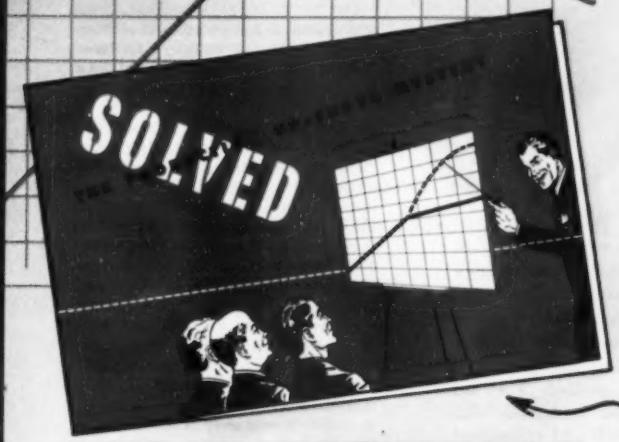
VENDETTA

What recourse has a foreman in a ship split by nationalistic feeling? Al thinks making the feuding parties split the same job would solve it, but would it? Is he just postponing the inevitable by not firing the miscreants when production suffers because of their squabbles? Do you agree with our readers—

THE inexperienced foreman, when confronted with an employee problem involving infraction of rules and regulations first thinks of termination of the employee's services as the solution. This is the easy way, but usually the wrong way to handle the situation. It costs money to hire and train new workers. Many employee problems are a result of the frailty of human nature. The foreman's job is to understand the human weaknesses of his men and mold them in the proper direction. Where lack of common sense and misunderstanding on the part of some of the employees has developed a "vendetta" situation with its disruptive influence on the morale of the shop, it is up to the foreman as leader of his shop to resolve the difficulty at once.

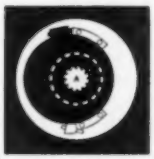
Nowhere can we find a supply of perfect workers. Every worker has certain shortcomings as well as abilities, even as you and I. But human conduct is predictable and under-

X Marks the Spot

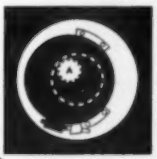


X marked the spot, high on the performance chart. That's where Company A's production curve should have gone.
Alas, it went *down* instead!
"Just what you'd expect," said the foreman. "This job calls for pretty near gage-block precision. To get that you have to sacrifice speed, don't you?"
Well—Company B had a similar job. Their production showed an up-curve.
How were they doing it?
Company A found the answer in the new booklet, "SOLVED: The Production Up-Curve Mystery." It tells how to do high precision metal-working at top production speeds . . .
Write for your copy today.

A PLANETARY FORM MILLER;
A PLANETARY THREAD MILLER; and
A COMBINATION FORM and THREAD MILLER
FOR BOTH INTERNAL AND EXTERNAL OPERATIONS

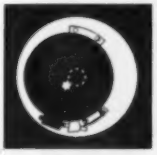


1. The work (dotted white circle) does not revolve. Cutter is revolved around work.



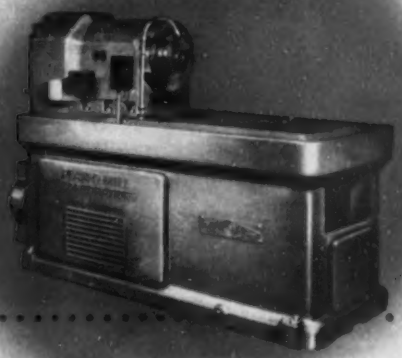
2. For internal thread and form-milling, cutter (A) moves out from center to contact with work.

3. Cutter moves in circle, completing cut; rapid reverse returns cutter to center.



4. For external milling cutter moves in to contact work; then moves around work.

PLAN-O-MILL



• REQUEST FORM •

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Please rush my copy of, "SOLVED: The Production Up-Curve Mystery"

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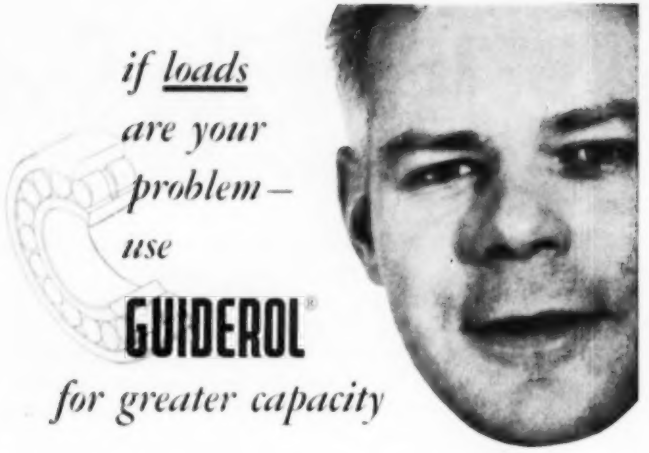
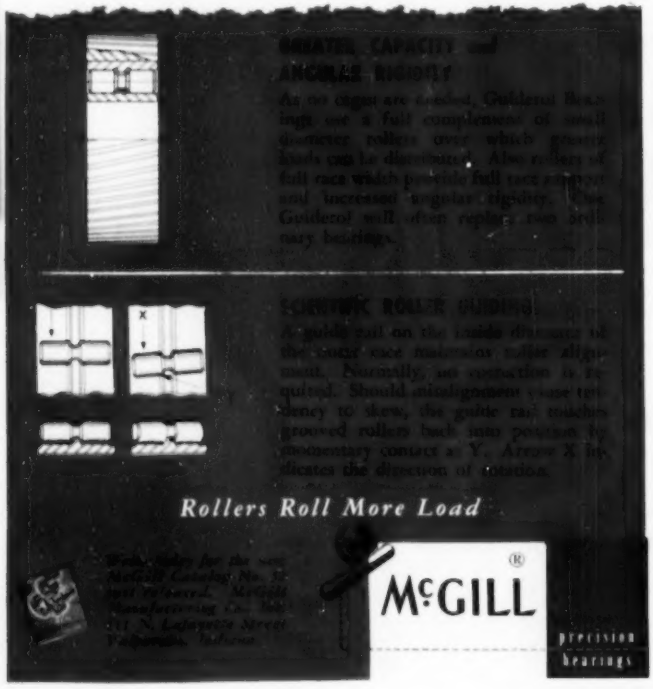
Address_____

City_____ Zone_____ State_____



Are you looking for a way to carry greater loads more efficiently in smaller spaces — a way to improve the performance of your tougher bearing applications without increasing bearing space? You'll find the answer in McGill Guiderol Roller Bearings because guided rollers permit full type roller construction without any possibility of roller skewing with limited misalignment. Capacity wasting cages are eliminated and still excessive internal looseness can be avoided. They are available in the MT and CT series — interchangeable respectively with roller bearings of needle type dimensions and ball and cylindrical roller bearings of single and double row ball bearing dimensions.



standable to the efficient foreman. In the case under discussion, where the conflicting personalities of two workers created antagonism and ill will and led to division of sympathy among the rest of the workers, the only solution lies in good judgment and firm action by the foreman. Management has selected the foreman for his ability to manage people and understand human relations, as well as for technical skill. The foreman of today has to be personnel-conscious and skilled in the techniques of handling people successfully. Restoration of amicable relations between the warring factions of the shop employees is the foreman's baby. A good step in solution of this problem is in the direction of applying the "window-washing" idea. A version of the old trick of putting two arguing guys washing opposite sides of the same window may work out in this situation also. In the case under discussion, putting the two antagonists on the same job; a tricky and interesting die, might enlist the cooperative efforts of both and help submerge their animosities in their common effort to lick a tricky job.

"Getting tough" will get the foreman nowhere with these types of workers. It will only result in losing the services of valuable and experienced workers. Diplomacy and leadership ability are the foreman's best weapons in fighting the problem.

Some foremen are much more skilled than others in gaining cooperation and enthusiasm from their workers. Such skill is not some mysterious gift, but is the direct result of knowledge and training. First, the foreman must have a sincere desire to be a good boss. The foreman is the peacemaker as well as the pacemaker for his men. Harmony in the shop depends not only on the workers but on the foreman. He is the leader and

"Talk about close tolerances! You ought to see what my kid's teacher said about the arithmetic I helped him with last week!"

ASK **BAIRD** ABOUT IT!

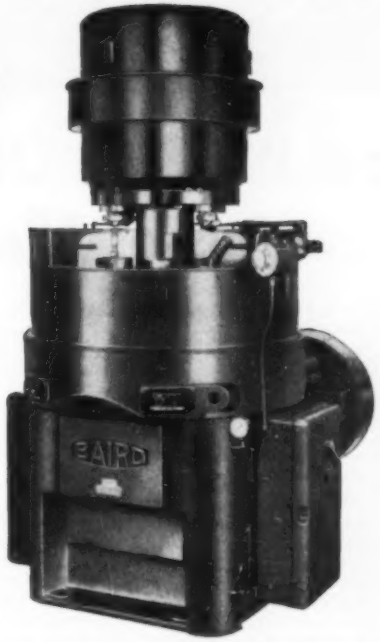
HIGH PRODUCTION TOOLING

GOOD WAY TO BREAK A PARTS BOTTLE NECK . . .

Just the type of machine smart production men are looking for *NOW*

because:

1. It's very **compact.**
2. It's very **easy** to tool and operate.
3. It's very ***simple*** and dependable.
4. It's extremely ***accurate.***
5. It's unusually ***versatile.***
6. It regularly turns in ***outstanding*** production records.



BAIRD NO. 54VC 4 SPINDLE VERTICAL LATHE

The versatility of the Baird No. 54VC (automatic vertical continuous lathe) makes it a most valuable machine for wet or dry cutting of light jobs such as boring piston ends, facing, chamfering, turning bands, etc. It has 4 spindles with 5" chucks mounted in the turret which revolves continuously, eliminating non-productive indexing time. The grip of holding fixtures automatically releases for operator to load and unload. Tools feed in and out of the cutting stroke.

Tools move horizontally for facing operations while other tools operate vertically for turning. Worm and gears drive the turret . . . spindles, mounted in roller bearing are driven by helical gears. Fool-proof controls prevent feed of tools to work unless spindles are revolving. Splash guard (as pictured) is used for wet operation. Speed changes are simple, inexpensive.

Baird engineers will provide tooling recommendations and case histories of accurate, fast, profitable production. Bulletin and specifications on request.

The BAIRD MACHINE COMPANY
STRATFORD • CONNECTICUT

HIGH PRODUCTION TOOLING

How We Take CHANCE OUT of Alloy Buying

Here's a spark tester checking bars of Ryerson alloy steel. By reading the spark pattern thrown off when each bar is touched with this whirling, abrasive wheel, the tester determines the steel's analysis. In this way he verifies quality—guards against mixed steels.

Spark testing is only one of many steps in the Ryerson Certified Steel Plan for safer alloy buying—a plan especially important to you today, while restrictions are enforcing the use of leaner alloys with unfamiliar heat treatment response.

We also put every heat of Ryerson alloy steel through four separate hardenability tests, carefully recording the results on a Ryerson Alloy Certificate which goes with the steel. These tests enable you to buy Ryerson alloys on the basis of hardenability as well as analysis—the safest way to buy under today's changing conditions. And the recorded test results safely guide your heat treatment. So play safe. Order from Ryerson where you can specify hardenability and be doubly sure. Stocks are out of balance from a size standpoint, but in all probability we can take care of your requirements.

PRINCIPAL PRODUCTS

CARBON STEEL BARS —hot rolled and cold finished
STRUCTURALS — Channels, angles, beams, etc.
PLATES—Many types including Inland 4-Way Safety Plate
SHEETS—Hot and cold rolled, many types and coatings
TUBING — Seamless and welded, mechanical and boiler tubes
ALLOYS—Hot rolled, cold finished, heat treated
STAINLESS — Allegheny bars, plates, sheets, tubes, etc.
REINFORCING — Bars and accessories, spirals, wire mesh
BABBITT — Five types, also Ryertex plastic bearings
MACHINERY & TOOLS —For metal fabrication

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC.—PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA DETROIT • CINCINNATI • CLEVELAND • PITTSBURGH • BUFFALO • CHICAGO MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

should recognize and seek to correct maladjustments in his employees and among his employees. These poor adjustments may be the result of wrong employee attitudes. Employees' attitudes do not usually spring up by accident. There is some reason back of every wrong attitude. One of the main reasons that the employee's thinking often gets twisted is that he is not in full possession of the facts. Being in possession of only part of the facts, he comes to the wrong conclusion and a wrong impression and attitude. The foreman should seek to correct these wrong attitudes where they become apparent by showing the errant workers the fallacy of their thinking. Animosity among the men, based on exaggerated ideas about personal backgrounds, results in disharmony, uncooperation and low morale in the shop. Tactful and impartial action by the foreman as teacher, conciliator and adjuster is just another facet of the foreman's job as a leader of his men.

Harry Kaufman
Philadelphia, Pa.

•

NOT ENOUGH CHIEFS

THE MANAGEMENT which contemplates job rotation is faced with a dilemma. Job rotation will probably increase the enthusiasm and happiness of the machine operators but it cannot be expected to increase the over-all productivity of the plant. Every machinist gets his experience at the expense of his employer and this expense can mount to fairly high levels. Unfortunately, few cost-accounting systems are capable of revealing in dollars and cents, just how much it costs management to increase the experience of its operators.

On the other hand, the value of the specialist machine operator is

"Wha'd'ya want I should do — get a certificate of necessity?"

THIS IS THE CUTTING FLUID YOU TOLD US YOU NEEDED

YOU WANTED STRENGTH OF FILM
which would give you longer tool life

YOU WANTED LUBRICITY
to withstand pressure and reduce friction

YOU WANTED VERSATILITY
one cutting fluid to do 90% of all jobs

YOU WANTED GERMICIDAL PROPERTIES
no rancidity, freedom from skin sores

YOU WANTED COOLER WORK
which could be handled bare-handed

YOU WANTED LOWER COSTS
how's 8¢ a gallon, in the machine?

THE ANSWER IS:

ANTISEP

ALL-PURPOSE BASE

—not a mere water soluble oil, but a fortified concentrate scientifically developed to give you "100 oils in one!"

ANTISEP "saves the day" for Cleveland valve manufacturer—cuts cost 50%!

After several prominent cutting fluids had failed to meet requirements, this concern decided to try Antisep, diluted 25 to 1, in the machining of valve stems from 416 stainless steel. Warner & Swasey 5-spindle automatic screw machines were used. Result: lower costs, improved tool life, greater uniformity in pieces machined. Parts come off cool, permitting higher speeds and heavier cuts.

E F HOUGHTON & CO.
PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

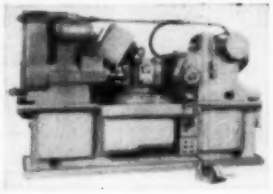
Ready to give you on-the-job service . . .

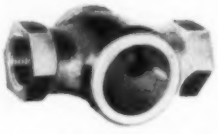
...and parts are finished without rehandling on

GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

The Goss & DeLeeuw "One-Two-Three" Chucker differs from the conventional machine in that it provides the means of machining more than one end of a piece in a single handling instead of requiring several handlings and set-ups. A worthwhile gain in production time is assured.

In the "1-2-3", work is gripped in chuck and all ends machined either in sequence or simultaneously. Goss & DeLeeuw and only Goss & DeLeeuw offers this feature in a standard chucking machine.





A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

GOSS & DeLEEUW MACHINE COMPANY, KENSINGTON, CONN., U.S.A

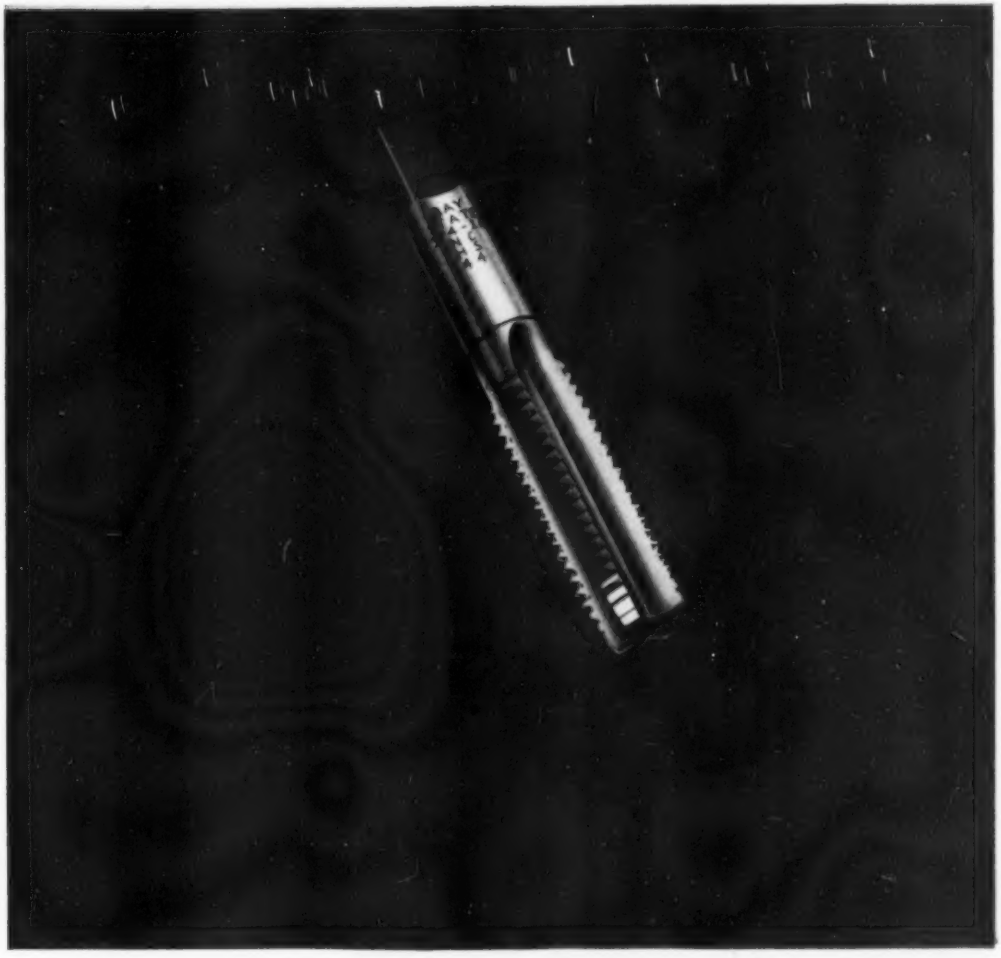
measurable by comparison of his performance with the standard time for the job. It is obvious to anyone who has had to observe operators in action and give effort ratings that the specialist machine operator turns out double the work of the man who is feeling his way around the job.

The small contract tool and die shop is a perfect working example of job rotation. Anyone who has had to pay the bills submitted by these organizations for work done is appalled at the low productivity of manufacturing units organized on the "jack of all trades" system. One has only to spend a few weeks working (as I have done) in a shop where a man is expected to work any machine, to realize that the system is inherently crude and out of line with the best principles of systematic management.

When a machine operator begins to increase his range of usefulness, he automatically demands more money. The result is that labor costs are increased tremendously. Management is evidently prepared to pay increased rates, evidence of this is revealed in the rates offered to experienced tool and die makers, who are traditionally expected to be able to operate any machine tool, have a knowledge of heat treatment and do a bit of welding on the side. Put a so-called skilled toolmaker on a centre (engine) lathe alongside a skilled lathe operator and the output of the toolmaker will be equivalent to that of a trainee.

The higher output of the specialist machine operator is not due entirely to constant practice and know-how, there are other factors such as auxiliary equipment. Over the years, the specialist has accumulated a store of special tools and gadgets which

"Sure, it's a progressive die — progressively worse every time you set it up!"



After more than a half century of research,
Bay State has developed a tap of material, design, and heat treatment
that will produce threads of the utmost precision with a maximum of productivity.
We refer to this dual quality of Bay State Taps as **Precision Performance.**
It is readily obtainable from nearby shelves of Industrial Supply Distributors.

BAY STATE TAP AND DIE COMPANY, MANSFIELD, MASS.

SKINNER
POWER CHUCKS

Skinner has a complete line of models for heavy duty production work on engine and turret lathes and automatic machines. Sizes from 6" to 21" with forged steel bodies, and with either 2 or 3 adjustable or non-adjustable jaws are available. The wedge angle is such that work is gripped positively, either internally or externally, regardless of jaw position. The chuck will not release the work, even if air line is broken, until operator actuates draw bar.

SKINNER
AIR CYLINDERS

Skinner double acting rotating or non-rotating air cylinders, for operating power chucks and fixtures, use a minimum amount of air. Large air ports give quick piston movement. Bronze piston packing spacer reduces friction and insures piston alignment and support. All packings are adjusted automatically by the pressure of the air against the flanges of the packings. Available for 6" to 21" diameter power chucks.

SKINNER
ACCESSORIES

Skinner power chucking accessories include: hand operating valve which is self-sealing and easy operating regardless of position—complete air unit including regulating valve, pressure gage and lubricator — filter to remove all impurities, scale, etc., from the air line — soft blank top jaws — draw bars — draw tubes, etc.

Sold by leading distributors in every industrial area

Write for catalog giving complete details on the Skinner line of power and manually operated chucks.

THE
SKINNER
CHUCK CO.
343 Church Street, New Britain, Conn.

SKINNER CHUCKS
THE CREST OF QUALITY

enable him to do an awkward job in double-quick time. He has a storehouse of memories of awkward jobs that have been completed successfully in the past and he has that special cutting tool which he ground for the job stored away in his tool box and the knowledge of how to use it to good effect.

The "jack of all trades" confronted with an awkward piece of work will first feel his way around it and then spend further time in making himself a tool suitable for the job. He will store the tool in his box in case he meets a similar problem in the future. It is very likely that he will never have need for the special tool during the rest of his working life because the number of very difficult jobs arising in the life time, even of a specialist, are limited in number. The "jack of all trades" has cost his employer money, first, in the extra time he took acquainting himself with the job, making the tool—and don't forget the cost of the material—then must be added the longer time he took to do the work because of his unfamiliarity with the machine.

Few firms seem to be aware of what it costs them in tool materials alone to keep a staff of all-round machinists. Is it not significant that giant-sized tool cabinets are the traditional equipment of toolmakers? If the contents of some of these huge boxes were investigated by management, the latter would get a very rude shock. In a tool shop with which I was associated, each of 16 toolmakers had two 20-ft lengths of saw band in readiness for work he may have to do on the shop bandsaw. This 640 ft of saw blading was a permanent stock lying idle and was only one item in a vast range of small

"Got crossed with our tank production line!"

tools and materials which the toolmakers had stored away. Where the specialist machine operator has stocks of tools to suit only his particular machine, the universal machinist must have a tool kit to meet the requirements of a dozen different machine tools.

Wear and tear of machine tools is always much more rapid where they are used occasionally by any one of a group of machinists. The expression "beat up" is the only one which can describe some of the equipment in tool and die shops where a machine is no one person's particular pet. A specialist operator has one particular machine on which to lavish his care and affection. Generally speaking, the operator will take a pride in the machine, adjusting it for wear, lubricating and cleaning it and generally being careful not to score the machine slides, break off handles and strip gear teeth. I have seen lathes that have been worked by one operator for several years that have been in new condition at the end of that time and which have turned out work at high production rates.

Job rotation may be an attractive idea to some men, but is not considered favorably by all. In the interests of maintaining production with a given plant and working force, the idea is not worth consideration by anyone who values a smooth-running organization.

Clifford T. Bower
London, England

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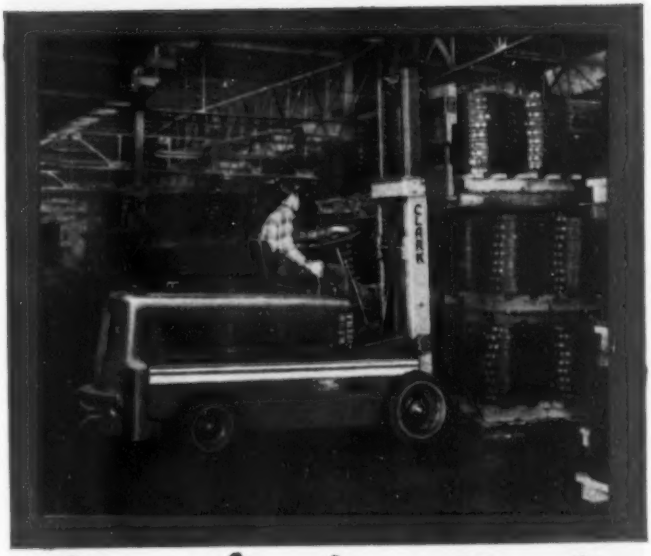
WHEN THE CAT'S AWAY

Must designs be followed regardless? Should an underling take it on himself to change a design, even as an improvement, without consulting someone in authority? Our readers thoughts on the subject—

APPARENTLY, from past experience, Merrill has learned that the chief designer, Lester, is not receptive to suggestions for improving his designs. Therefore, Merrill showed a great deal of courage in going ahead with the change while the foreman was away and without the correct amount of authority. The consequences, if he had failed, would have been his alone; he couldn't help but know that. This is not to condone Merrill's action as good procedure in normale times. However, isn't it better to try, assuming the blame of failure, when the only alternatives are either to hold up the work until the foreman returns or to go ahead with a poorer design? Those seem to have



Strictly for Profit

CHOOSE CLARK

Solely on the basis of *benefit to your business* take a thoughtful look at the Five Factors of Profit built into Clark machines:

1. **TIME PROFIT**—Materials move faster, and in synchronized flow. Man-hours for loading and unloading are reduced drastically.
2. **SPACE PROFIT**—Idle space becomes profitable storage capacity.
3. **TURN-OVER PROFIT**—Speeding up the production cycle improves the inventory picture, conserves working capital.
4. **MANPOWER PROFIT**—Human productivity is sharply increased to offset shrinking manpower. Workers prefer the better jobs.
5. **SERVICE PROFIT**—Prompt, efficient service, provided by Clark's nationwide organization. *Keeps equipment working.*

Any way you look at it, your Clark investment gets you a solid, profitable "most for your money."

There's a most profitable time to look into it—RIGHT NOW! All the literature items are designed for your profit. Please use the coupon to order them.

CLARK ELECTRIC AND GAS POWERED FORK TRUCKS
AND POWERED HAND TRUCKS · INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIVISION • CLARK EQUIPMENT COMPANY • BATTLE CREEK 3, MICHIGAN
Please send: ☐ Movie Digest ☐ Safety Saves ☐ Basic Facts ☐ Material Handling News
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Rolling Large Diameter Threads on 5" Rocket Motor Nozzle
REED
4 to 6 Threads per minute
The Reed Thread Roller has overcome major threading problems in the producing of 4 3/4"—12 threads on 5" Rocket Motor Nozzles. With the previous production methods, difficulty had been encountered in obtaining squareness and 100% inspection was required for accuracy and smoothness.
The Reed A32 Cylindrical Die Thread Roller produces accurate threads that are much smoother and have a high degree of surface finish. Squareness of the thread with the shoulder is held to within one-half of the required tolerance with simple tooling. Production is at the rate of 4 to 6 threads per minute.
Only spot checking of the threads is now required, and inspection costs have been reduced over 65%.
Send us specifications of your requirements and let us supply you with complete information.
REED ROLLED THREAD DIE CO.
Manufacturers of
THREAD ROLLING MACHINES and DIES • KNURLS • THREAD ROLLS
Worcester, Massachusetts, U. S. A.
AM-625

been Merrill's alternatives. Merrill is a *man*.

Actually, this situation should never arise. No man in any position is irreplaceable, and certainly dogmatism in the position of chief tool designer (which should be the source of considerable methods improvement) should never be tolerated. A true designer is one who is looking for the best design, whether it comes from his own mind, the mind of an executive or the mind of the floor sweeper.

Our plant, admittedly a small one, has eliminated the problem in question by placing the tool design department under the authority of the toolroom foreman. Thus, when the eye of the machinist or the toolroom foreman catches a flaw in the design or a chance for improvement of the design, the matter can quickly and sensibly be talked over among the parties involved, with the tool foreman having the authority to decide on the final design. A designer who is working in a spirit of cooperation with the other experts in his field and working at the same time for the best interests of his company can benefit considerably by such an arranagement. His sense of security is in no way impaired, there is an air of tranquility between departments, and he can nearly always be sure that the best design has been used. This system works in our plant. I know; I am chief tool designer.

Robert B. Ogden
Shortsville, N. Y.

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THIS DISCUSSION recalls the days of the early functional shop organizations and their controversies with the purely military shop organizations of 50 years ago. There was a third type, then and now, but it was unrecognized and unorthodox and functioned, at its best, under cover. Perhaps it could be called "individualist organization," and Merrill belonged in such a classification. Such men are in fact lawless but their lawlessness is an asset to the shop and they well know the old adages: "Nothing succeeds like success," and "Rules are made to be broken." So they gamble for their own satisfaction in better accomplishment against the penalties that would follow failure.

The widely acclaimed father of scientific management was asked, nearly 50 years ago, what action should be taken if a machinist ignored the procedure indicated on an instruction card and, following his own methods instead, was able to produce the work satisfactorily in

cut filtering costs up to 75%

with New Automatic Self-Cleaning COOLANT FILTER

For individual machines or small central systems

Eliminates frequent, costly filter changes...takes up less floor space

New WEB-O-MATIC Coolant Filter employs rotating filter belt that cleans itself . . . reduces filter operating and maintenance expense up to 75%! Continuous, automatic operation requires virtually no attention, effectively removes chips, abrasive particles, harmful solids. Handles large volume of coolant in minimum floor space; 50 GPM model (for soluble oil coolant) is only 43" x 53½".

Mesh and speed of belt may be varied to suit volume, viscosity and contamination of coolants. WEB-O-MATIC is ideal for all types of grinders, broaches, drilling, lapping, milling machines, etc., wherever a mineral or soluble oil coolant is used. Capacities 50 to 400 GPM of soluble oil coolant.

Write for WEB-O-MATIC Bulletin with complete information, specifications, etc.

a

Two Types Available

(a) Houdaille WEB-O-MATIC with built-in ramp for applications requiring above-floor installation.

(b) Houdaille WEB-O-MATIC for applications requiring discharge of chips and contamination below floor level.

WORLD'S LEADING OIL FILTER MANUFACTURER

Honan-Crane Corp. 205 Wabash Avenue, Lebanon, Indiana

A Subsidiary of **Houdaille-Hershey Corporation**

In Canada: E. W. PLAYFORD, LTD., Montreal 28
W. E. MICKLETHWAITE, Toronto 18
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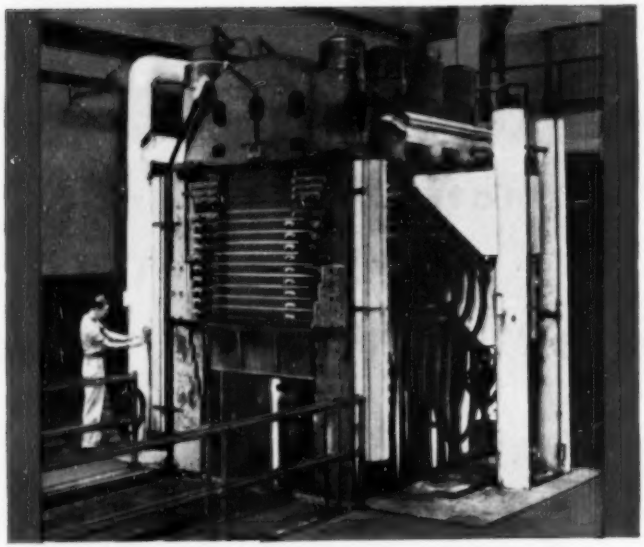


NATIONAL PLASTIC thermo-sets Plastic Laminates with 3500-ton

FARQUHAR HYDRAULIC PRESS

The National Plastic Products Company, of Odenton, Maryland, required a hydraulic press for use in the thermo-setting of their NEVAMAR Plastic Laminates . . . a press that would be able to mold this material to very close tolerances.

Farquhar engineers supplied the answer with this built-to-specifications Hydraulic Press. The complete, self-contained hydraulic pumping unit has a capacity of 3500 tons. Each of the 15 hot plates has a clear working area of 50" x 100". Total working stroke: 49".

The efficient Farquhar hydraulic circuit operates with a minimum number of valves —thus reducing maintenance cost considerably.

Its production problem solved, National Plastic is now successfully turning out Plastic Laminates to their exacting requirements.

Farquhar Presses Cut Your Costs

Just one more example of cost-cutting Farquhar performance in heavy production. Farquhar Presses are built for the job . . . assure faster production due to rapid advance and return of the ram . . . greater accuracy because of the extra guides on moving platen . . . easy, smooth operation with finger-tip controls . . . longer life due to positive control of speed and pressure on the die . . . long, dependable service with minimum maintenance cost!

Farquhar engineers are ready to help solve whatever production problem you may have. Give them a call.

Send for Free Catalog showing Farquhar Hydraulic Presses in all sizes and capacities for all types of industry. Write to: A. B. FARQUHAR CO., *Hydraulic Press Division*, 1506 Duke St., York, Pa.

Farquhar
HYDRAULIC PRESSES

half the specified time. His reply was that the man should be severely disciplined, as should also his supervisors, because it was just as much a crime to exceed or depart from authorized instructions as it was to fail to carry them out. But we must remember that this oracle was not himself a qualified machinist nor had he ever done a day's manual or skilled labor for a day's pay.

The shop in which he was then introducing his rigidly detailed procedures was affiliated with another shop a few hundred miles away in which similar and often identical products were made and in which the same sort of equipment existed. Both shops cut medium-sized cast-iron and steel gears and silent-chain wheels. Both had about the same quantity of gear cutters, and of the same capacity range, and both shops had more of these machines than were needed.

Under his management, one skilled man operated three machines, setting up the jobs and changing the work, and operating them at all the speed and feed possible for a cutter life of three hours between grinds—just as called for on the Instruction Cards.

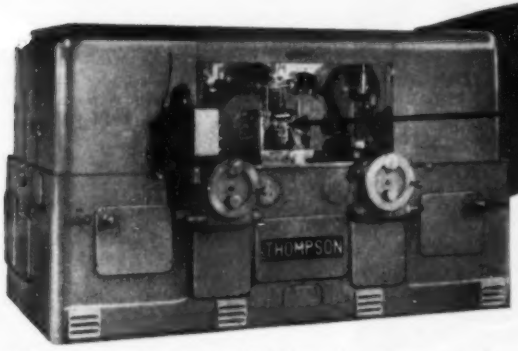
The work produced was passable, but only that. On steel work, the cutters left the work with heavy burrs that required considerable filing for each tooth. The deburring was done by other than the machine operators and required about half as many labor hours as were required for machining. The life of the machines was materially shortened and cutter cost and grinding was high.

In the other shop the setups were made by the foreman, as he had the time, the work was changed on the machines by the floor sweeper, as he had the time, speeds were moderate and feeds were low and there were

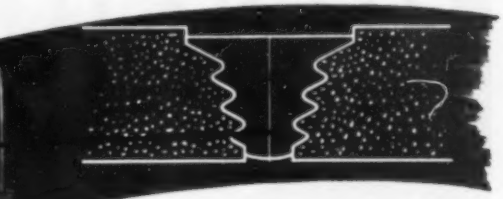
"Okay, Mack, how about that five bucks you owe me?"

New Thompson AUTOMATIC double wheel TRUFORM Grinder speeds jet engine production

GRINDS BOTH SIDES OF JET TURBINE BUCKETS OR BLADES SIMULTANEOUSLY IN A SINGLE SETTING



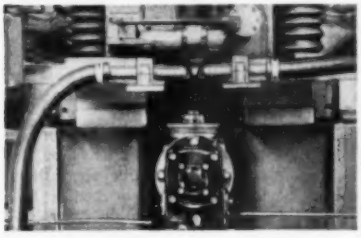
To grind root sections on gas turbine buckets with greatest accuracy and productivity, Thompson developed this new AUTOMATIC double wheel TRUFORMING machine featuring simultaneous grinding of both sides of root section with one setting of work.



Grinds rough to finish in 110 seconds . . . or 30 buckets per hour

Hood doors, work clamps, coolant flow, grinding and crushing cycles are actuated in automatic sequence on the new Thompson AUTOMATIC double wheel TRUFORM Grinder.

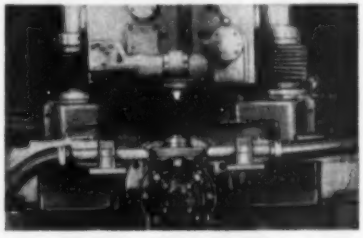
On a bucket having 2" length of form similar in design to the one in the diagram above with .150" stock removal per side from rough to finish size, production is 30 buckets per hour at a steady day after day rate. This includes down time for dressing, regrinding the crusher roll, initial machine warm up period, wheel changing and diamond changing. Actual machine time from rough forging or casting to finish is 104 seconds plus 6 seconds for loading and unloading time . . . makes total time floor to floor 110 seconds per piece.



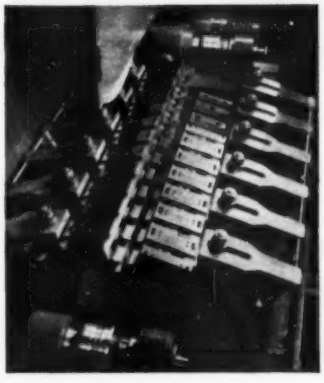
FOR ABSOLUTE SYMMETRY BOTH WHEELS ARE DRESSED FROM A SINGLE CRUSHER ROLL

GRINDING POSITION

CRUSHING POSITION

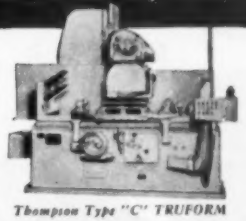


Standard THOMPSON TRUFORM Machines also grind jet buckets faster, better



By means of multiple grinding of jet turbine buckets the standard TRUFORM Grinders still offer high production plus many advantages such as flexibility of standard machine design and lower first cost. Although compared to the new AUTOMATIC the standard TRUFORM requires more skillful set up and tooling.

Typical tooling on Type "C" TRUFORM producing 24 buckets per hour. Type "B" TRUFORM produces 18 parts per hour.

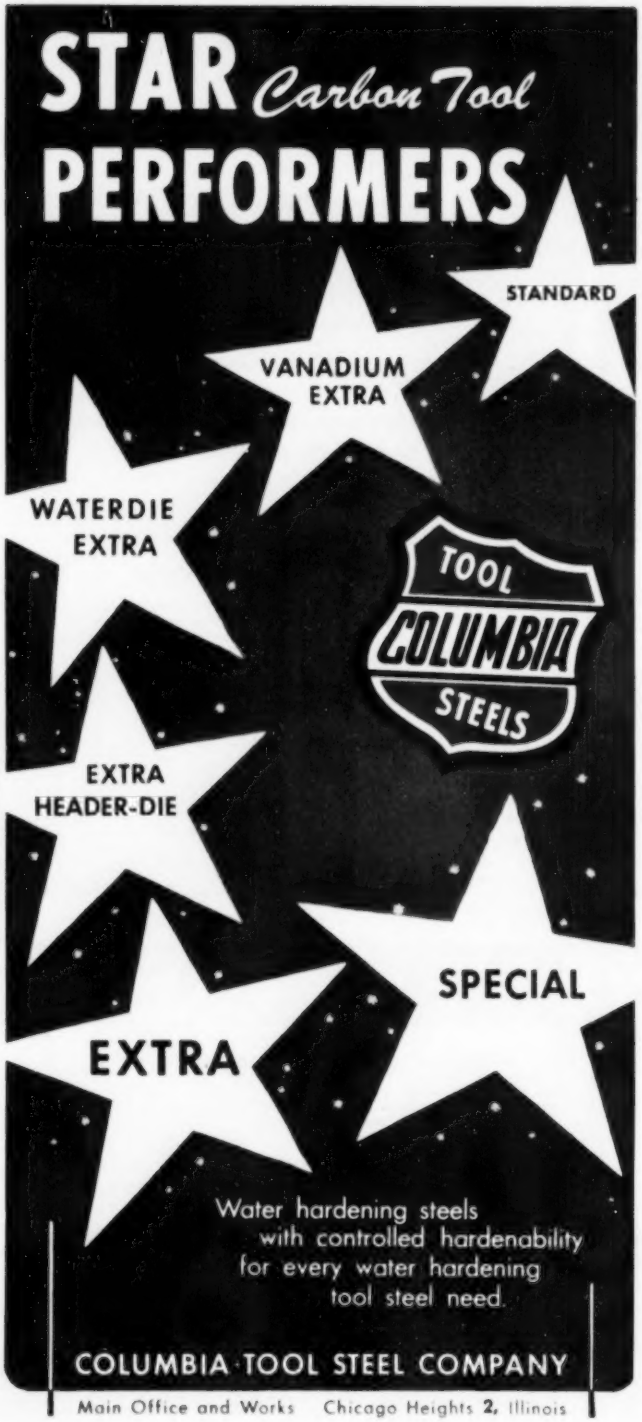


Thompson Type "C" TRUFORM

FOR COMPLETE DETAILS WRITE TODAY

The Thompson Grinder Co.
Springfield, Ohio

Thompson SURFACE Grinders



no burrs that could not be removed by brushing a file over the rims. The cost of gear cutting would have been three times as much in this shop had the Instruction Cards of the other shop been introduced and followed.

For some years, in the shops of clients, this writer has made a practice of spot-checking the work to be performed against the procedure and issued instruction and has arrived at the conclusion that in a very large percentage of cases it would be possible to improve procedure and reduce costs if the men on the machines and their supervisors were given some latitude in respect to this matter.

Of course, they can "suggest" and can usually get instructions altered, but that often is too much trouble and they are not always certain of what they could accomplish until they have tried it. It should be possible to demonstrate their ideas by departing from instructions, without getting into trouble.

Luciens I. Yeomans
Chicago, Ill.

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IN THESE DAYS we are concerned with an organizational setup of industry. We are trying to get a proper set up between staff and line. We are trying to get more appreciation and understanding of the part the other fellow plays. Rules and opinions change and we must change with them.

On the other hand when we establish policies — then they are made and we must live up to them. The rules cannot be broken regardless of rank. If we do break the rules we have no policy. Practice must always be in line with policy Every man is responsible and should be held responsible. There are however, when the rules are issued, a few top brass who administer them to suit themselves. A sound policy is written down in black and white in language everyone will understand. With a sound policy we do not have to fear someone higher up.

The employee Merrill stuck his neck out when he changed the fixture on the machine without notification to the design engineer. As this fixture was redesigned by Merrill he should not have made the change without first telling those in authority. An employee as enterprising as Merrill needs careful handling. Merrill should be first congratulated on this new design and then explain to him the design engineer's feeling in the matter. By showing appreciation of the idea Merrill will feel good and should

BASIC FACTS ON GEAR TOOTH CROWNING

End Bearing

Elliptoid Tooth Form

Q. *Why are gear teeth given the Elliptoid tooth form or crowned?*

A. To PREVENT "end bearing" in service.

Q. *What is "end bearing"?*

A. A concentration of load at the end of the tooth due to end contact between teeth rather than its distribution along the entire tooth face —the condition for which the tooth was designed.

Q. *Why is "end bearing" objectionable?*

A. Because it imposes concentrated stresses beyond the fatigue strength of the material at the contact point which may lead to premature failure. It is also an important cause of noisy gear operation.

Q. *What is gear tooth crowning?*

A. A calculated elliptical reduction in tooth thickness from the point of maximum crown (usually the center) toward both ends. Normally it amounts to .0003" per inch of face width per side, but this is optional depending on service conditions.

Q. *Can "end bearing" be avoided by any other method?*

A. No. Because

1. It is practically impossible to assure perfect alignment under all conditions of loading due to unavoidable deflections in shafts, bearings and the mountings, all of which are elastic.

2. It is also impracticable to avoid all fire distortion in hardening gears which have been machined previously.

Q. *How are gear teeth crowned?*

A. On Red Ring Shaving Machines.

Q. *Can the amount of crown be controlled accurately?*

A. Positively. Such a large number of leading automotive gear plants would not be using it otherwise.

Crowning is controlled on the Model GCI Shaving Machine by locking the cam which actuates the table movement at the desired point. Models GCU and GCV use formed cutters ground precisely to the amount of crown required. No variation is possible without changing cutters.

In a random check of 4000, 1" face gears the maximum variation in the amount of crown was within the specified tolerance of .0002".

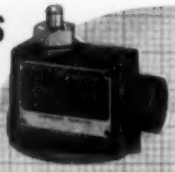
Write for
BULLETIN 549-5
for a more detailed discussion of gear tooth crowning.

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

Clearing's Hydraulic Riveting Press uses Thirty-one MICRO Precision Switches for "almost-human" operation!

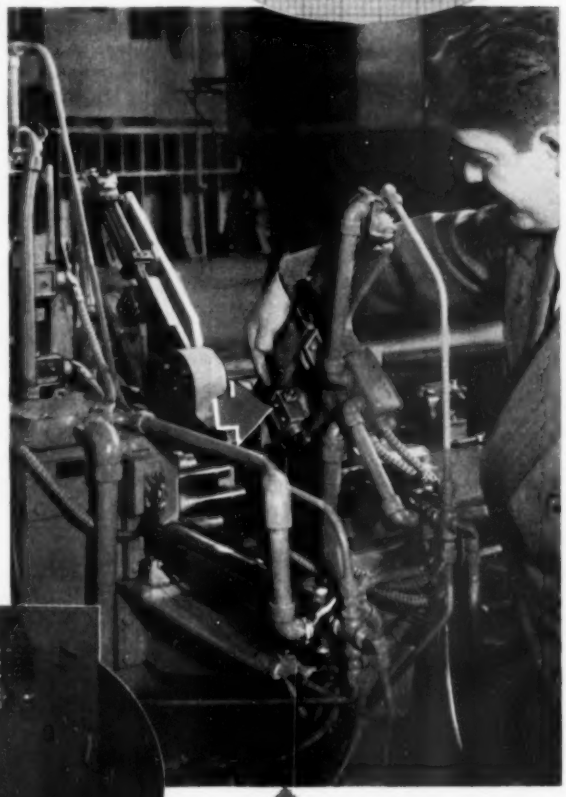


Let a MICRO SWITCH Engineer show you how you can "use MICRO Precision Switches as a principle of good design."

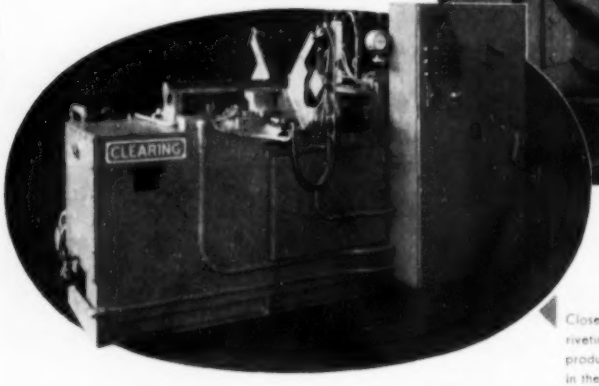
Clearing Machine Corporation's experience with MICRO Precision Switches in the "good design" of their new hydraulic riveting press will interest management men whose design staffs are seeking perfection in new products, or improvement in present ones.

This "almost-human" press performs ten operations automatically in riveting a plate to an aircraft-engine crankshaft. To protect press and crankshaft alike against damage from misalignment of the part being processed—or from carelessness by the operator—MICRO units are used to give foolproof control of the various steps of the riveting operation. Clearing's engineers chose MICRO SWITCH controls because of their recognized precision, dependability, sturdy construction and long-lived performance.

Whatever *your* problems of product design or redesign, if they involve small, sensitive precision switches, turn first to MICRO SWITCH. Consultation with a company-trained MICRO SWITCH field engineer costs nothing. He will gladly recommend the proper MICRO unit—either one of more-than-5000 stock switches, or a specially-designed one—to meet your individual need. Just call or write the MICRO SWITCH branch office nearest you.



Clearing engineer points to MICRO enclosed switch which prevents operation of this riveting press unless the part is properly seated.



Close up view of Clearing's special hydraulic riveting press on which MICRO SWITCH products are used to control the various steps in the riveting operation.

MICRO MS SWITCH

FREEPORT, ILLINOIS

MICRO Snap-Action Switches
Honeywell Mercury Switches

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

then be prevailed upon to admit his mistake to the engineer. This should appease the engineer. It would afford the design engineer the opportunity to explain that he is there to help—not hinder—new ideas.

A. E. Salmons
Philadelphia, Pa.

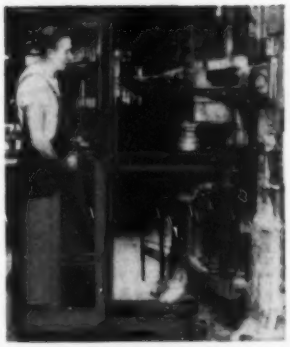
•

THERE SIMPLY *must* be some kind of rule of action which is universally respected in any shop or department, or you have industrial anarchy. The mere fact that Merrill felt sure his idea would work out all right, that on this basis he was willing to take the risk, and that it *did* turn out well, changes the thing not a whit basically. Granted that many rules laid down in many shops are not *wise* rules. They are still better than no rules at all. Grant, if you choose, that personal pique on the part of the designer will now enter into the situation. Merrill still did wrong.

Industry may be regarded as analogous to national life, in reference to its rules and laws. Where there is no respected rule of action, only brute force or its equivalent can be exercised, and as far as practicality (ignoring morality) is concerned, might makes right. Therefore, in a nation or a heathen tribe where there is no thought whatever of concerted rule, or rule by the people, the strongest man is chief of the tribe until the time comes when he is outwitted or overpowered by some man a little stronger than he, whereupon there is a new chief. This might be in some sense compared to certain sections of industry in the older days, where the foreman had to be a two-fisted, bull-necked, cruel type of tyrant in order to make his men respect him. But even here, there is a certain type of unity of action, even though it be compelled by brute force.

If Merrill is allowed to "get away" with the thing he has done, it will be an encouragement to him to continue such practice in future, and it will encourage all others who are unruly in nature and spirit to do likewise. Men being what they are, rules or law can be enforced only when they are invested with sanctions, or with rewards for obedience and penalties for disobedience.

This is not to say that if good ideas possessed by Merrill and other men throughout the plant are stymied by suppression from the chief designer or any other higher-up in the plant, the matter should be ignored and allowed to continue. Ignoring such a situation will definitely stifle all initiative on the part of individual



4 PICTURES TELL THIS TRUCK'S STORY

1 IT TRANSFERS DIES

Time to change dies — and one man does it with this RAYMOND Platform-Type Electric Tiering Truck. The truck elevates to storage rack height for easy die transfer, then speeds through crowded production areas, positioning the die right at the machine.

2 SPEEDS UP SHIPPING

Loading is fast when this RAYMOND Platform-Type Truck lends a helping hand. So compact, so maneuverable it operates with ease in boxcars, truck trailers, elevators. Features patented* knee-action swivel caster to compensate for uneven floors.

3 BRINGS MATERIALS

Production hums with the RAYMOND Platform-Type Truck to keep raw materials coming. It actually operates in aisles where only hand trucks once went, thanks to its short length and patented* off-set drive wheel with 200° turning arc.

4 STORES PARTS

It's a quick trip from plant floor to warehouse with this RAYMOND Platform-Type Electric Truck. It travels up to 3 1/3 mph loaded, 4 mph empty — operates safely on low-capacity elevators, floors — comes in both 2,000 and 4,000-lb. capacity models.

RAYMOND

PLATFORM-TYPE
ELECTRIC TIERING TRUCK

MAIL TODAY

For More Facts send for Bulletin 710! Ask to see the RAYMOND Platform-Type Tiering Truck demonstrated. *PATENT NO. 2,594,005

The RAYMOND CORPORATION
Formerly LYON-Raymond Corporation
4777 Madison St., Greene, N.Y.

Gentlemen: Please send me Bulletin 710 on your Platform-Type Tiering Truck. I'd like to see a demonstration: ☐ Yes ☐ No.

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COMPANY _____
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NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

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WELDED DESIGN IMPROVES APPEARANCE

. . . while cutting costs 50%

BY converting to welded steel, this progressive manufacturer has achieved a more modern, better selling appearance for his products. At the same time he has cut costs 50% on some components.

Pleasing appearance in a product generally indicates efficient use of materials in its design. With welded steel, cumbersome and often costly dead weight, inherent with gray iron, is essentially eliminated. Wall thicknesses in steel are of exact design size. In addition, steel can be shaped at low cost with simple shop equipment.

While attaining stronger, more rigid products, in addition to improved appearance, savings in materials alone often run as high as 85%. Your Lincoln representative can show you how to apply the cost-saving benefits of steel to your products. Call or write.

Incentive Management—A thought-provoking approach to developing greater teamwork between employee and employer. Written by James F. Lincoln. Price only $1.00 postpaid in the U.S.A.; $1.50 elsewhere.

Fig. 3. Steel-Designed Blower *built by The Beardman Company, Oklahoma City, Oklahoma. Eliminates milling and drilling operations . . . is easier to clean and paint.*

PROPER DESIGN IN WELDED STEEL ALWAYS IMPROVES PRODUCT AND LOWERS COST

Fig. 1. Original Construction. *Required 41% more metal than present welded steel design. Heavier weight with gray iron added to handling costs in shop, in shipping and final installation.*

Fig. 2. Present Weldesign in Steel. *Saves 50% on cost. Has better appearance . . . greater selling appeal. Is stronger . . . more rigid.*

HERE'S MORE PROOF

Machine Design Sheets are available to designers and engineers. Write on your letterhead to Dept. 104

THE LINCOLN ELECTRIC COMPANY

CLEVELAND 17, OHIO

The World's Largest Manufacturer of Arc Welding Equipment

workmen, and particular care should be taken to see that it does not happen. But if Merrill or any other man in a department or shop cannot find a way to bring a given idea to light in accordance with shop rules, it would be much better to let it die than to do what Merrill did. This is a hard thing for many men to do, but it is one of those things that is necessarily hard.

Putting it another way, we might sum up such situations in the aggregate by saying that an established rule of action is inevitably a blessing, because it produces unified effort and enables all concerned to work with agreement and understanding. It may (as in this particular case) be a curse even while it is a blessing, and in an occasional isolated instance the evil may seem much greater than the good. For all that, any improvement purchased at the cost of wilfully ignoring established rules is ultimately an extremely bad bargain.

John E. Hyler
Peoria, Illinois

•

JUST WHAT KIND of a company do Al, Ed, and Merrill work for? Why should any organization—no matter how large or small—set up a policy by which everything has to be done by one man? It has never been proven that any designer, no matter how good knows everything about making tools and fixtures work. Therefore, why should Lester consider he is any exception?

It is true that there must be a clear-cut policy on how to take care of design problems. Normally they should be handled by the tool-design group. These men are usually well qualified to do at least a passable job in tool design. They have made it their business and more times than not, they have a far simpler answer to the complex problem than can be developed in the shop. However, in establishing a policy governing the design of tools, the company management must set up one which is sound and which will work efficiently.

It is implied that Lester had previously made it known that he and his group were the "experts" in such work and that no changes were to be made in the tools or fixtures. The fact that Merrill's reason for not contacting Lester was fear of a refusal should certainly be investigated. If Lester is so hard to get along with that the boys in the shop feel that an idea for improvement will create an argument, something certainly must

Minneapolis-Honeywell Mounts Machinery on

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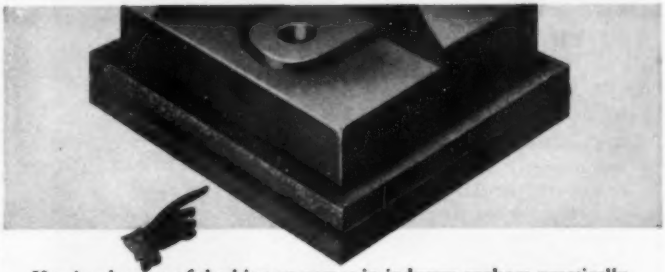
...drilling avoided...floors saved!



Here's why one of the biggest names in industry anchors practically every kind of machine on floors of every construction in the modern way... *on UNISORB!*

TRANSMITTED MACHINE NOISE and VIBRATION REDUCED 60% to 85%

Lowers machine and building maintenance costs

Higher speed machine operation often possible

UNISORB ANCHORING REQUIRES NO BOLTS, NO LAG SCREWS

Old-fashioned, destructive floor drilling eliminated

Saves installation time as much as 80%. Labor costs reduced

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AMERICAN CHEMICAL PAINT COMPANY

AMBLER ACP PENNA.

Technical Service Data Sheet

Subject: HOW TO MAKE PAINT STICK TO GALVANIZED IRON WITH LITHOFORM®

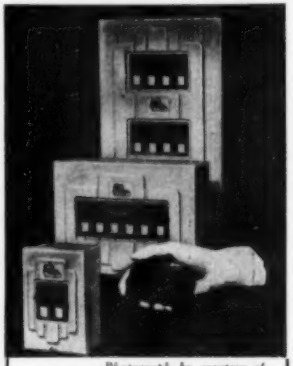
INTRODUCTION

"Lithoform" forms a dense, zinc phosphate coating on zinc, cadmium, and galvanized surfaces—including Galvanneal, cadmium plated steel, zinc plated steel, zinc base alloys, and zinc base die castings. The "Lithoform" coating, which is non-metallic and inactive, retards reaction between alkaline metal oxide and the paint film. Peeling and loss of adhesion are thus greatly retarded on painted Lithorized zinc and cadmium.

ADVANTAGES OF "LITHOFORM"

"Lithoform" forms a durable bond for paint. It is economical. It eliminates frequent repainting. It protects both the paint finish and the metal underneath. "Lithoform" meets these Government Finish Specifications:

QQ-P-416
RR-C-82
MIL-E-917A (Ships)
JAN-F-495
AN-F-20
U.S.N. Appendix 6



Photograph by courtesy of Murray Manufacturing Corp.

Murray Circuit Protectors are fully magnetic and provide maximum protection for both domestic and industrial wiring. Housings are of galvanized iron which is Spray Lithorized for long paint life.

THE LITHORIZING PROCESS

"Lithoform" can be applied by brushing or spraying the work with simple hand equipment, by dipping it in tanks, or by spraying it in industrial power washers.

Brush. Galvanized bay windows, cornices, rain gutters, hardware, building siding, truck panels, and farm equipment are typical of the many surfaces that are treated effectively with Brush "Lithoform".

Dip. This grade is used for coating cleaned surfaces of such typical products as cabinets, refrigeration condensers, etc., immersed in heated solutions in tanks.

Spray. The spray process is the most logical one with which to coat sheets, coiled strip or duplicate products best processed on a conveyor.

CHEMICALS ACP PROCESSES

WRITE FOR FURTHER INFORMATION ON "LITHOFORM" AND ON YOUR OWN METAL PROTECTION PROBLEMS.

CHEMICALS ACP PROCESSES

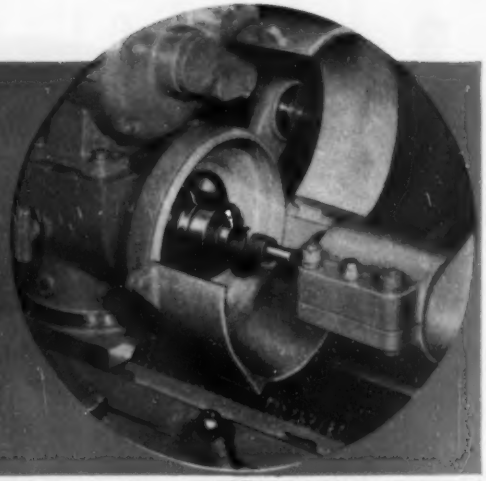
be done to change that picture. No man in a position of authority in design, or in fact any type of engineering, should ever give the impression that he will not listen or take under advisement any suggestions regarding the work he or his group is hired to do. It is true that many times the ideas coming from the shop will not blend into the particular pattern of events as known to the design group. But, nevertheless under no circumstances should the shop personnel receive a "brushoff." This causes friction and many times good improvements are lost to a company because of this attitude.

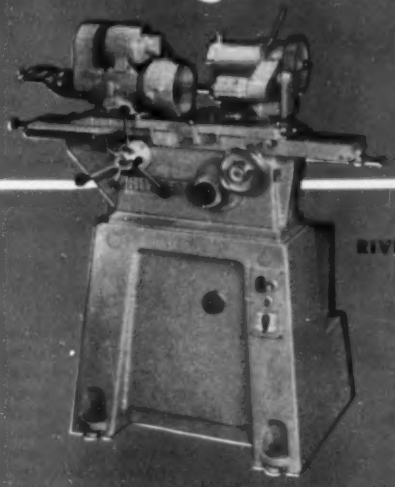
This is not always entirely the fault of the engineering group alone, but too frequently stems from management groups or individuals within the company. Too frequently, the feeling is fostered that asking or seeking advice is to admit that one does not know and that in itself is a crime. However, the most successful companies are those which use ALL the talent that is available to them and those that seek out information from all employees.

To come back to the problem at hand—it would be foolish to get after Merrill. He has made a worthwhile contribution to the company and one which will pay dividends. Why, or even *how*, can one criticize this work? Perhaps he did act a little out of the ordinary. He should be cautioned about this, but it is company policy that is at fault and which should be altered. Merrill should, if his supervisor is away, feel free to approach the design

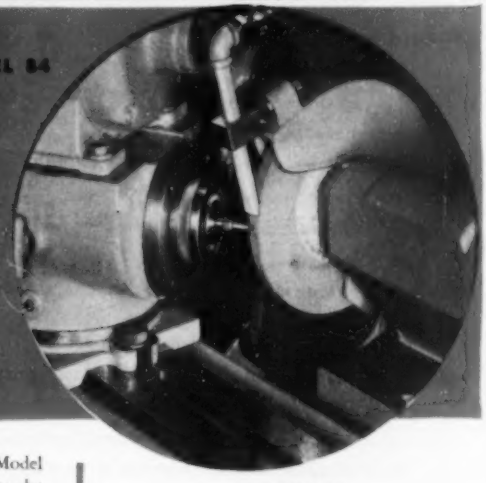
"Citation from N.P.A. commending us on being the leading scrap producer for the sixth straight month!"

A new small hole grinder





RIVETT MODEL 84



Easily converted for external grinding

Flexibility keynotes this new Rivett Model 84. Primarily a small hole grinder, it may be equipped for external grinding. Simplicity reduces set-up time on the variety of work normal to the toolroom and die shop. Collets and step chucks quickly mount single or repetitive pieces.

The new Rivett 84 grinds holes from the smallest up to 3" diameter, with a maximum 4" depth depending upon diameter; external work to 3" diameter by 4" length.

If you need versatility with extreme accuracy, you will want to learn more about this new grinder. Send for Catalog 84.

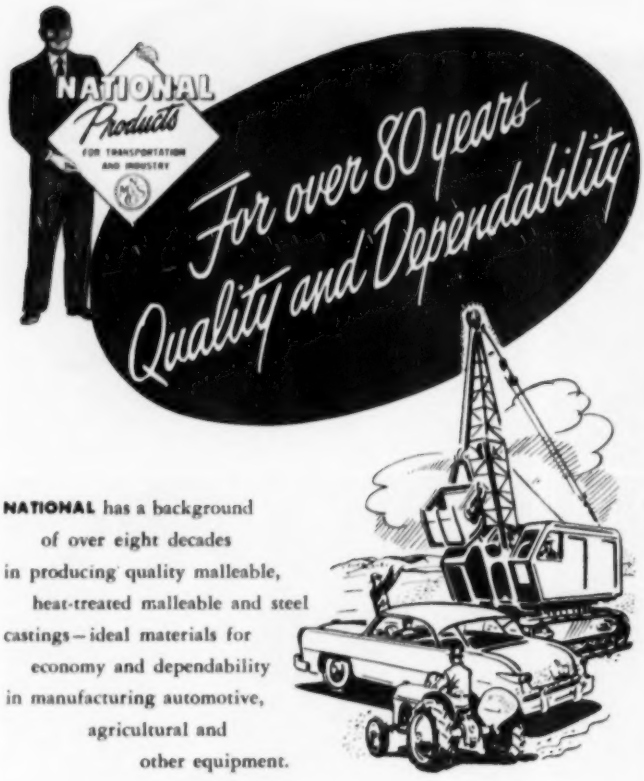
FEATURES

- ★ Optional Wheelheads for internal and external spindles.
- ★ Internal Spindles 12,000 to 35,000 r.p.m.; sealed from grit and pre-lubricated for life.
- ★ Lathe-Type Workhead Spindle mounts draw-in collets and step chucks directly.
- ★ Micrometer Table Stop for positioning work when shoulder grinding.
- ★ Mechanical Power Table Travel with infinite adjustment of speed and stroke.
- ★ Hand Table Travel with coarse and fine feeds graduated to .001".
- ★ Hand infeed with coarse adjustment to .001", and fine to .0001" reduction of work diameter.

RIVETT LATHE & GRINDER, Inc.

Dept. AMR4, Brighton 35, Boston, Massachusetts

For More Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master Craftsman's Master Tools



NATIONAL has a background of over eight decades in producing quality malleable, heat-treated malleable and steel castings—ideal materials for economy and dependability in manufacturing automotive, agricultural and other equipment.

NATIONAL'S unparalleled experience—coupled with a continuing metallurgical research program, rigorous quality control standards, and completely mechanized foundries in strategically located cities—is at your disposal.

Sales offices and engineering facilities are located at all five plants listed below.

A 16mm technicolor film. Narrated by Edwin C. Hill, this 27-minute film tells how malleable iron is made . . . tested . . . used . . . how its production economy, ductility, machinability, toughness will give you a better finished product. Available for group showings. A-5017

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NATIONAL MALLEABLE and STEEL CASTINGS COMPANY
CLEVELAND 6, OHIO

group and talk over his ideas.

The shop must naturally live by the company policy, but they certainly should try to improve not only their tooling but should also change the policy which limits them. The foreman, by seeing to it that the line supervision knows what is going on and placing facts and figures before his supervision can influence the actions of the different staff departments. These staff departments are only service departments. They must supplement the line organization and assist them. Their policies must be developed in such a manner that they help, not hinder, the production division.

Foremen: Don't just sit back and moan about how badly you are used by the engineering divisions . . . do something about it! Get your supervisors to think about the problem; they can help you if you will let them.

Charles D. Townsend
W. Hartford, Conn.

•

WHO SAYS HOW

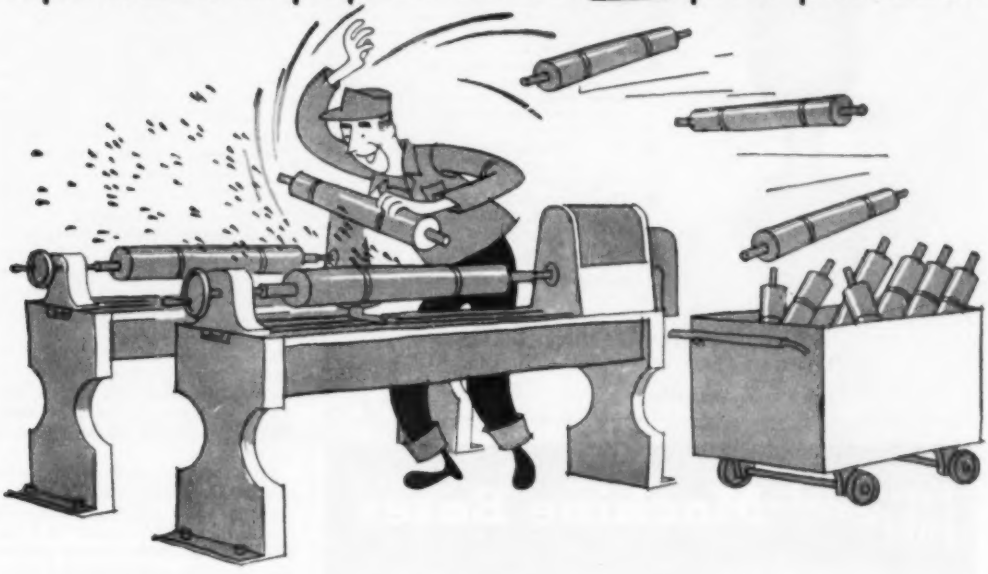
THE QUESTION of the use of process sheets, job-instruction cards, routing sheets (or whatever term is applied to the paperwork), has long been a sore spot with first-line management. This is perhaps more of a problem to the old timers in the foreman class. They can remember when they had all the power of hiring, firing, worker instruction, improvement of methods and many other details which were not of a supervisory nature.

Now the removal of most of these staff functions has given the foremen more leisure time to handle men and to see that employee problems as they concern the getting out of the product on schedule are efficiently handled. In giving our foremen leisure time we have also set them to thinking that they are being slowly stripped of all authority.

This is not the plan and they should get a clear picture of things as they exist today in our industrial world. Our educational training has changed. We train specialists in certain jobs. Their work is limited to one type of staff function. We have developed methods men, time-study engineers, process and project engineers, detail designers and many other specialized phases of our complex industrial world. The foreman is still one of the most important parts of our company. He is the worker's idea of the company. He represents —to the worker—the president and

MAGNESIUM

high machining speed means more pieces per hour!



When it comes to machinability, you can't beat magnesium! Generally, the maximum rate of machining speed is limited only by the maximum speed obtainable on modern machine tools. This, of course, means more pieces per hour and a sharp cut in production costs. One source reported a 50% reduction in machining costs over the metal previously used.

Another outstanding machining characteristic of magnesium alloys is their ability to take an extremely fine finish. Surface smoothness readings of three to five micro-inches have been reported for finish-turned magnesium. Finish-grinding operations required on other metals usually can be eliminated.

Cutting tools designed for steel or brass may be used, but to take full advantage of magnesium's machinability, tool design should be slightly modified. It is suggested that relief angles be increased and clearance angles made larger to provide greater chip space.

Dow has over 30 years of experience in magnesium—a call to your nearest Dow sales office will put this knowledge at your disposal.

THE DOW CHEMICAL COMPANY

Magnesium Department • Midland, Michigan

New York • Boston • Philadelphia • Atlanta • Cleveland • Detroit • Chicago • St. Louis
Houston • San Francisco • Los Angeles • Seattle
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"We've put our coolant worries behind us" with RUTHMAN GUSHER COOLANT PUMPS

Your coolant system is no better than the pump which controls it. That's why leading machine-tool builders everywhere specify Ruthman Gusher Pumps.

- They're simple in design, balanced, precision built, with fewer parts. You're sure of longer life with less maintenance costs.
- They're efficient in operation. Give split-second control of coolant flow.
- They're moderate in initial cost, low in operating and maintenance cost.

Specify Ruthman Gushers for best coolant pump service.

THE RUTHMAN MACHINERY CO.
1818 Reading Road, Cincinnati, Ohio

Precision Fabricated • Machine Bases

...AT LOW COST!

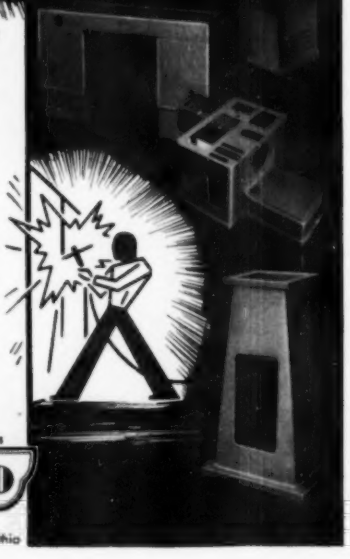
MODERN DESIGN—Welded metal fabrication lends itself to efficient, modern design. Littleford modern machines and skilled men make shaping of metals a simple task.

LESS WEIGHT AND BULK—Unwieldy and needless mass and weight are eliminated in a Littleford Fabricated Base.

STURDY AND SHOCK PROOF—Littleford fabricated metal units have all the inherent strength, toughness to withstand shock, strain, vibration and severe service.

ADAPTABILITY—Littleford Fabricated Bases adapt themselves to changes and improvements at any time with a minimum of expense.

Littleford complete fabricating and manufacturing facilities are at your service. Send blueprints for estimates on Bases, Guards, Pans or special Machine Parts, see how Littleford fabricated products can save money.



FABRICATORS OF PLATE AND SHEET METALS

LITTLEFORD

LITTLEFORD BROS., INC.
421 E. Pearl St., Cincinnati 2, Ohio

all of the other top-line management. If he can do a good job selling the company to the workers, the company has a successful operation. This job alone is no simple task and due to this many other staff jobs which can be handled by specialists have been removed from the foreman.

Specialists can be good and bad. It is just the same as any phase of work. Certain individuals take attitudes that make for unhappy situations. They do not get the pulse of the organization, therefore cause friction.

In the development of job instruction cards no doubt each foreman and his key personnel have had some say on the instructions. Usually this is company policy. Occasionally an outside concern is engaged to set up such systems. On some of these occasions, due to pressure of time, some things are passed by. Not enough training or co-ordination takes place and a feeling of helplessness is developed in the foreman. It is necessary, then, for the company, after the system has been installed, to blend and shape these rough corners into the organization. This work naturally calls for another type of expert or specialist who can see the existing problems and set up programs to overcome these problems and get everyone working toward the same goal.

No instruction sheet is worth the paper it is written on if it cannot be changed. The changes naturally should show improvement in better quality of product or more production. However, sometimes it is necessary to revise time data or operations which have little or no effect on the final cost of production.

Every foreman should think of in-

"In your job application you put down that you were very experienced in cutting through heavy steel with a torch."

when the HEAT is on . . .

TAKE IT *Off* with KENNAMETAL

When the metal-cutting job is rugged — specifications precise — delivery schedule tight — use Kennametal tooling to "take off the heat".

Kennametal tools are remarkably hard, strong, and tough. They stay on the job longer . . . require fewer trips to the grinding room. Idle machine time is minimized . . . skilled operators work to best advantage . . . tooling costs drop — and productivity rises through higher speed and heavier feeds.

Kennametal gives this superior performance — consistently — because its physical structure is sound and uniform — a characteristic which is imparted and maintained by distinctive processes under the direction of men who know carbides from "the ground floor, on up".*

Men — with technical "know-how" — make Kennametal an outstanding tool material. And — the skilled men who operate and are in charge of metal-cutting machines fully realize its plus-value when "the heat is on".

POUR IT *On* with KENTANIUM

When there is urgent need for a material having longer service life and improved performance under high temperatures — Kentanium offers outstanding advantages.

It has much better stress rupture characteristics than conventional alloys even at 1600°F, a superiority that becomes more pronounced as temperatures increase. From 1800°F to 2200°F, for long periods, and up to 4500°F for short exposures, it withstands oxidation while retaining unusually high strength, and shows no weakening under thermal shock.

Much lighter than steels and conventional alloys, it presents design and operating advantages, particularly for rotating, or reciprocating parts.

Kentanium is suitable for: gas turbine components, valves and seats for gas engines, hot spinning tools, hot extrusion dies, and many other applications. If your design problem involves high temperature conditions, let us demonstrate how you can safely "pour on" more heat when structural elements are made of Kentanium.*

KENNAMETAL

**Kennametal Inc. mines basic raw materials, refines all its carbides directly from ores, oxides, and by-products, processes these carbides into Kennametal compositions . . . then engineers and fabricates complete tools and wear-part designs that fully utilize the distinctive properties of Kennametal.*

KENTANIUM

**Kentanium—developed and produced exclusively by Kennametal Inc. — is chiefly titanium carbide with nickel as auxiliary metal (no tungsten or cobalt). Made in several different compositions to meet varying conditions. Available as standard extruded shapes . . simple molded forms . . intricate designs.*

CUT AWAY METAL FROM INTERNAL CYLINDERS "MOSTEST AND FASTEST" WITH

FULMER HONING MACHINES

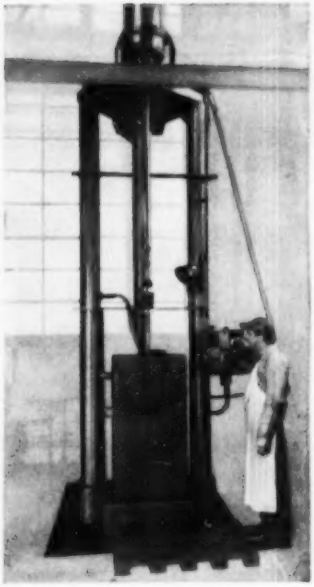


Photo taken in plant of The Frank G. Hough Co., Libertyville, Ill., world's largest tractor-shovel manufacturer.

Speed and amazing accuracy . . . these are two outstanding features of Fulmer Honing Machines.

SPEED exact, uniform, constant up to 1/16" from diameter at 1½ to 2 cu. in. per min. save time and cost and assure economical operation.

ACCURACY achieved through the self-aligning hones which remove the rough spots of the internal surface and then hone the cylinder to tolerances as close as (plus or minus) .0001" on ferrous and non-ferrous metals, plastics and glass.

Constructed and engineered for over-capacity loads; minimum parts, most of which are interchangeable.

Machines are set up easily and quickly. Operators can be taught to function skilfully in a few hours.

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struction sheets as a tool. He should see that this tool fits his purpose and should make any necessary adjustments until it is a smooth functioning device. If the foreman and the company management will strive to correct the difficulties that arise from errors which have come from haste in making up instruction sheets, the over-all program of the use of job instructions or routing sheets can pay definite dividends. This is especially true where green or untrained help is used to get out production.

In work I supervised, I have found that job instructions properly done can increase production from 10 to 20%. Changes in such sheets are necessary and must be kept up with current improvements and changes in methods.

No foreman once understanding the value of this type of aid would want to go back to the old days when he had to keep everything in his head or in a "little black book."

Charles D. Townsend
W. Hartford, Conn.

•

IT IS TOO BAD for Ed, but the time when a foreman could be "all things to all men" is gone forever. Things have become so complicated that no one can keep up with new developments except just to know that they exist.

Not very long ago, a foreman, on receipt of instructions to produce a new gadget, could and very often was expected to:

1. Study the design and improve it to facilitate manufacture (for in those days, the engineering department would not deign to consult the shop).
2. Plan manufacture.
3. Plan jigs and fixtures.
4. Establish costs by deciding on piece-work rates.
5. Order materials and follow up on deliveries.
6. Hire operators with necessary qualifications.
7. Produce.

With the complexity of present designs and high accuracy demanded, how long would a foreman live before men in white came to get him if he had to make a reasoned decision on all points covered above unless he built up an organization to do the detail work for him.

And this is exactly what management has done for Ed. The job instruction cards when issued presuppose that along the line someone has consulted with the shop so that the ultimate design of the gadget is made of the right materials, does not re-

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with amazing new ease!

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EXTRUDITE PROCESS
interlocks lubricant with work surface!

The Extrudite Process opens the door to faster, less-wasteful cold forming of steel and other metals. This Detrex development chemically interlocks a dry, heat-resistant lubricant to the work surface . . . metal-to-metal friction is prevented even during the most severe working conditions.

Savings are tremendous on operations such as wire and tube drawing, deep drawing, cold heading and room temperature extrusions. To name but a few of the benefits; operations are speeded up on present equipment, tooling lasts longer, parts are produced with less scrap and many process anneals and chemical treatments are eliminated.

The Extrudite Process consists of a special phosphate coating which becomes integral with the work surface. Then a compatible lubricant is applied which drys to a tough, crystalline lubricating film. Thus the treated metal is clean and easy to handle.

If you are now performing or considering cold forming operations, the Extrudite Process should be investigated. **Detrex Corporation, Box 501, Detroit 32, Michigan.**

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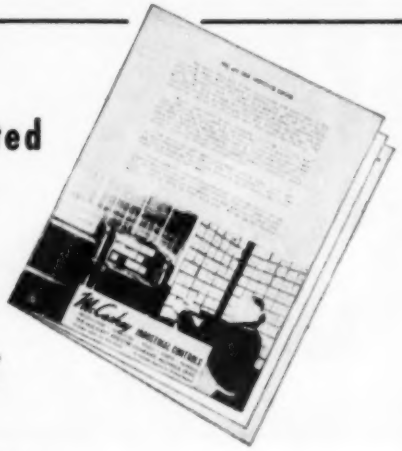

. . . describing and showing suggested procedure and forms which will give you:

Reinspection date follow-up;

Location and condition of each gage and measuring instrument, loaned or in cribs;

Gage and Instrument History record;

Central clearance record of each employee's gages and instruments;

Tool and gage inspection report;

Gage tag, conditional release tag for tools (fixtures), and faulty tool and gage tag;

Instrument and gage withdrawal order, etc., etc.

. . . all designed for complete control with speed, accuracy and minimum clerical work.

Close control of inspection of your gages, instruments and tools will reduce spoiled work and rework costs . . . and improve your product quality.

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quire impossible or expensive manufacturing operations, that the proper tooling for the right equipment is provided for, that methods and costs have been established, that materials and equipment and their deliveries are attended to and that there are qualified workers available.

And before the present foreman can sit back he still has to produce, and that will keep him busy.

The issuance of instruction cards will not stagnate methods if improvements are possible and if a successful suggestion system is in use. The cards should be corrected and the next time the job comes along, the best method is on file without recourse to somebody's memory. We all know how reliable that would be.

Incidentally, it might be advisable for Ed to obtain the help of a psychologist to realize that seeking help from another is not a sign of failure.

P. B. Fenaux
Lynn, Mass.

•

PUNCH LIFE is generally a small fraction of die-plate life; about 1:10 seems a fair average. Therefore, to prolong punch life, it is sound practice to spend more on the punch material and reduce regrinding.

NEW BOOKS

A TREATISE ON MILLING AND MILLING MACHINES (THIRD EDITION). *896 pages, 3700 illustrations and charts. Published by the Cincinnati Milling Machine Co., Cincinnati 9, Ohio. Available from the Technical and Service Publications Dept. Price, $8.*

Those of you who were *AM* readers in 1950 will recall the nine excellent articles by Mario Martellotti on several milling subjects. Those articles on milling cylindrical surfaces in the toolroom, dies and molds, use of dividing heads, attachments for toolroom milling, and selection of production milling processes were deliberately selected from chapters that Mr. Martellotti had finished for the above book. Our purpose was to pick out the kind of information that is not easily come by, and at the same time is useful to many people.

However, these nine articles did not exhaust the subject of milling by any means. This book covers milling

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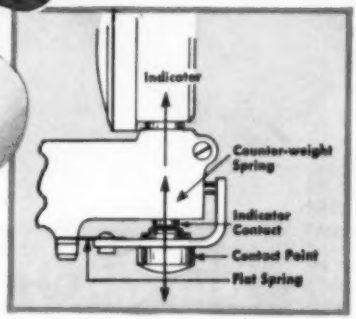
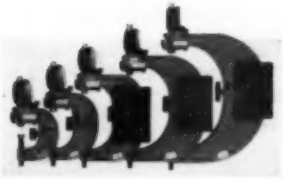
Because the Dial Indicator is free . . . while measuring the dimension



UNAFFECTED BY SHOCKS AND FRICTION

The flat spring supporting the contact point takes all the shocks and side thrusts — the indicator contact point merely rides on the gage contact point. There is no tendency for the indicator spindle to bind. Counterweight spring offsets weight of gage and of inspector's hand.



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Model 1000 P-3 (1¾" to 3¼")
Model 1000 P-4 (3" to 4½")
Model 1000 P-5 (4" to 6")
Price, any one gage with .0005" grads. $57.50
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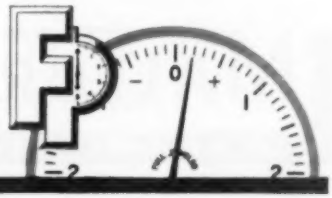

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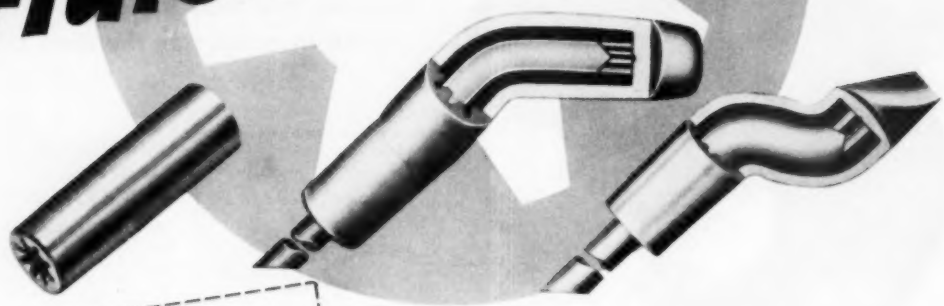

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in a way that should be understandable to all, and at the same time provides the basic principles. If formulas are required, they are given, followed by examples that are clearly worked out step by step. Sketches show extreme care in depicting exactly what is required in a setup, proper terminology and completeness in explaining the basic principle involved.

Nineteen chapters are contained in the book. They cover such subjects as: the milling machine; accessories; cutters; sharpening and care of cutters; fundamental concepts in the milling process; mounting of milling cutters; use of the milling machine for toolroom work, production work, dies and molds, making cams; fixtures and fixture design, and estimating production milling. The book is complete, and the price represents only a fraction of the cost of compilation.

•

HOW TO IMPROVE ENGINEERING—MANAGEMENT COMMUNICATIONS —*Prepared by The National Society of Professional Engineers, 1121 Fifteenth St. NW, Washington 5, DC. 46 pages (paperbound). Price $2*

This booklet presents results obtained from a nationwide survey of 350 industrial companies employing some 50,000 engineers. Findings indicate to what extent engineering personnel participate in management decision, how participation is obtained, what engineers want to know about management policy, and the extent to which the management potential of engineers is being developed. The report sums up the survey findings with a review of new techniques and the latest research on improving group communications, and suggests a detailed formula for improving engineering-management communications.

•

CIVIL DEFENSE IN MODERN WAR—*By Augustin M. Prentiss, Ph.D, Brigadier General, U. S. Army (Ret); with a chapter, "Air Power Today" by A. M. Prentiss, Jr., Colonel, U. S. Air Force. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. 440 pages. Price $6.*

In the present world crisis, warfare is not as simple as A-B-C, but rather as complicated as A-B-C. Why? Because the A-B-C's now have a modern connotation, Atomic-Bacterial-Chemical, words with a meaning so

AUTOMATIC CONTOUR MILLING MACHINE . . .
for accurate, high speed production milling of long parts in aircraft industry. Completes up to 4 operations at one time.

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high speed milling with rotary table feed of work to cutter. Operation is milling ¼" groove on irregular inside contour.

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Not an act but a *fact* . . . these Onsrud four star performers *do* speed up non-ferrous metalworking. These Onsrud machines are designed by men with years of specialized experience in high speed machine tool building . . . men who know and keep abreast of every development in machining or fabricating aluminum, magnesium, and related metals. That's a big help in lowering production costs, earning greater profits, and doing better work. That's also why, when demand is heavy and production goals are great, you will find Onsrud machines today in key aircraft, armament, and civilian production plants all across America.

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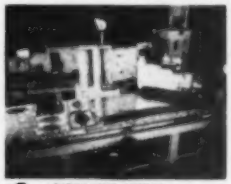

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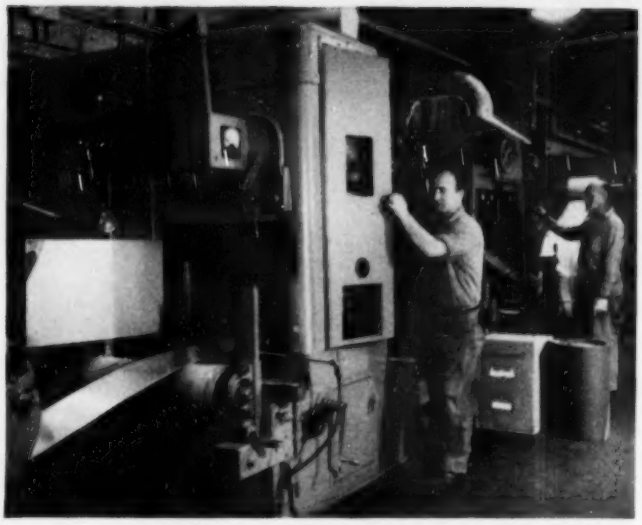

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terrible that we blot them from our minds, and call it "apathy."

General Prentiss says, "—there are ways and means effectively to counter such enemy action and enable the civil population adequately to resist such attacks—". But our greatest danger is apathy and lack of familiarity with the threat! Survival depends upon knowledge.

The problems are discussed in three phases: Modern Air Warfare, Civil Air Defense, and Organization for Civil Defense. First, we are told what we face including methods of air attack, high explosives, chemical agents, incendiaries, bacterial agents, atomic agents, and how each is chosen for use. Then, General Prentiss tells us how to protect ourselves against these weapons and, finally, how to organize for mutual self-protection.

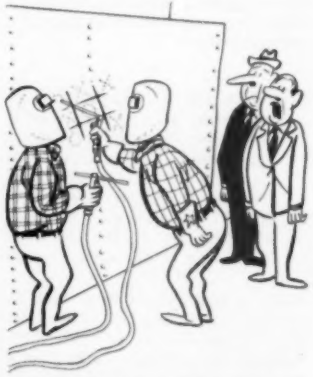
This book is especially useful as a background and reference text for people organizing and planning civil defense programs.

•

COMPRESSED AIR IN MINING AND INDUSTRY—*By Sydney H. North. Published by Sir Isaac Pitman & Sons, Ltd. Distributed by Pitman Publishing Corp., 2 W. 45th St., New York 19, N. Y. 170 pages. Price $4.*

That compressed air is capable of performing an almost endless variety of tasks is the central theme of this book. Examples are drawn from widely different fields—from coal mining to brewing—and data are given to indicate the advantages and adaptability of compressed air.

The information is almost entirely of a general nature, with the emphasis largely on mining, quarrying,



"I don't mind if they make a game of it, as long as they get some work done!"

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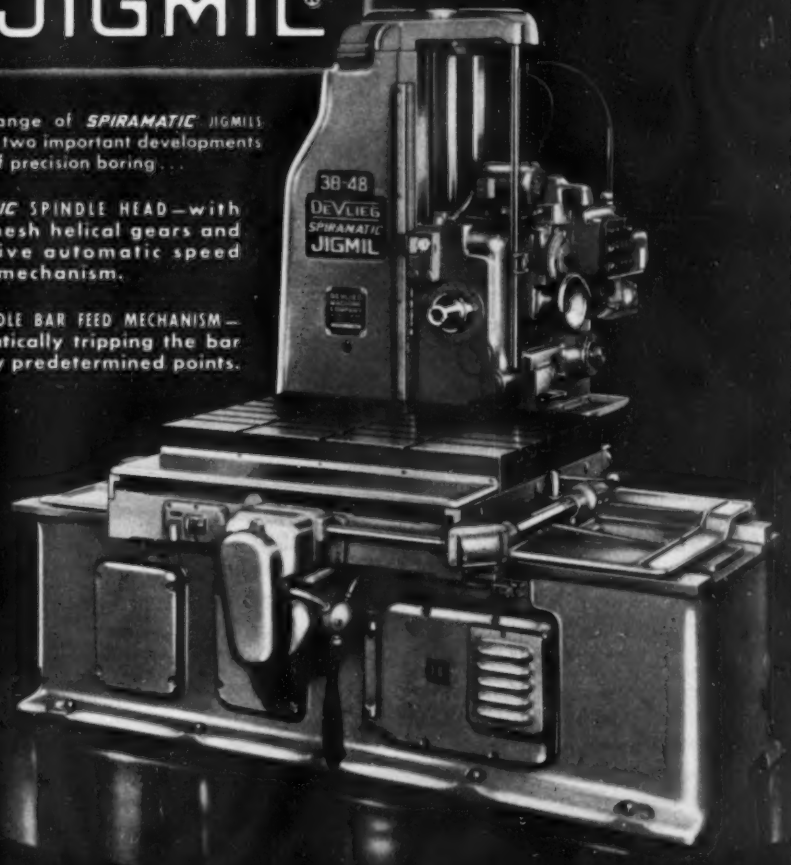

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and similar applications, although a few metalworking examples are also presented. Engineers who deal with compressed air will perhaps find the book of value, as presenting a general picture of the broad field of application open to their medium.

•

MACHINE SHOP MATHEMATICS (NEW 2ND EDITION)—*by Aaron Axelrod. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. 359 pages. Price $3.60.*

Offers a thoroughly revised text that provides a broad base for applied mathematics and for the general education of the shop student and apprentice. Using an improved presentation and new illustrations it covers the mathematics required in a machine shop and includes related information on machines, machine parts, tools, metals, and shop procedures. All material conforms to latest machine-shop practice.

Problems are based on scientific analysis of trade-school work and are arranged in order of progressive difficulty, starting with a review of general shop arithmetic. Trade terms are used throughout and are defined as they are introduced.

•

SURFACE AREA AND VOLUME OF DISHED ENDS—*By D. E. W. Aldous. 23 pages. Published by Emmott & Co., Ltd., 37 King St., Manchester 3, England. Price 2/6.*

Both formulas and graphs are supplied, and the latter are easy to apply. Graphs are constructed in two ways: (1) for the general case when R, D and r are all variable, and (2) for when D equals R and r is variable. In British practice, the major radius R of the dished end should not exceed the vessel's diameter D. If R equals D, the work is easier to dish.

•

ELEMENTS OF HARDENABILITY—*By M. A. Grossman, U. S. Steel Co. Published by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. 164 pages. Price $4.50.*

Standardization of the hardenability ratings for heat-treatable steels got its start about 1926, but remained comparatively unknown outside of metallurgical circles until 1938. In that year, Jominy and Boegehold reported the end-quench test as a means of measuring the

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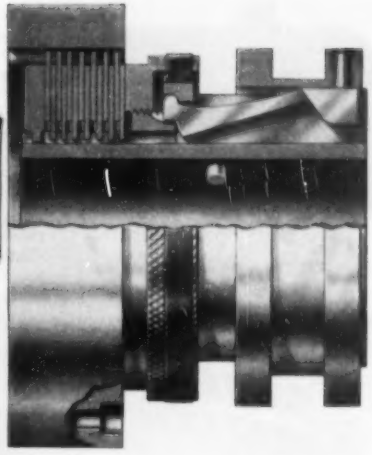

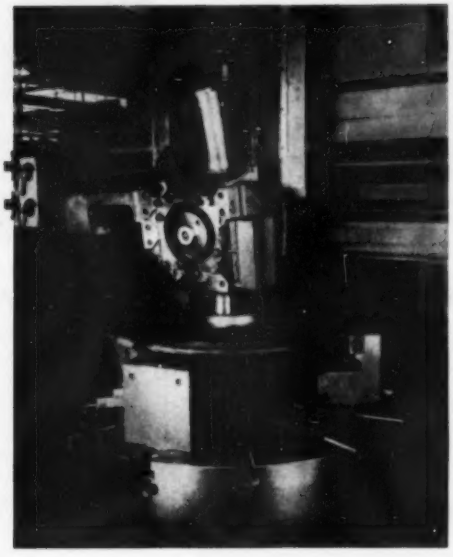

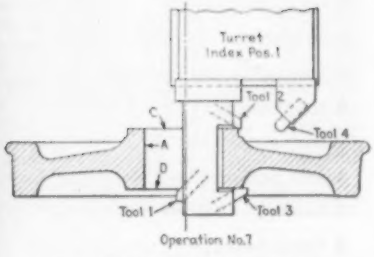

Turret index Position 1, the rough boring is performed. Tool set-up faces the hubs. (There are 4 index Positions.)

THE BULLARD COMPANY, outstanding machine tool manufacturer, selected Maxitorq floating disc Clutches for power transmission control in its famous Man-au-trol vertical lathe.

A Bullard engineer says, "Two No. 22 Maxitorq Clutches (see arrow) are used to automatically engage the cross-feed and down-feed drives for Angle Turning. In order to maintain accuracy, no slippage can be tolerated; the No. 22 Maxitorq Clutches are suitable for this application." In the job shown 12 carbide tools machine both sides of a Diesel engine wheel in 64 minutes, automatically. Former method required 4 hours.

If you have clutch problems look to Maxitorq... 8 standard sizes to 15 H.P. @ 100 r.p.m., wet or dry, single or double. Also in Automatic Overload Release type. All clutches manually adjusted, taken apart or assembled. Variety of special Driving Cups available. Complete engineering recommendations on request. Join our many "Good Company" users.

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- Lengthens die life
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hardenability of the case on carburized steels. And in following year, Jominy showed that the principle could be applied to the whole broad class of heat-treating steels.

In recent years, hardenability ratings of many steels have been issued as a joint activity of technical committees of the ASM and the SAE. Now that alloys are scarce, we are using more and more of the H-steels (lean-alloy materials) to replace conventional SAE steels. Therefore, hardenability is a subject which is striking ever closer to the shop and control of production. For this reason, Dr. Grossman's book should command attention by readers other than metallurgists.

In four easily readable, but authoritative chapters, he gives the story about hardenability tests, the nature of hardening, the nature of quenching, and the effects of alloying elements upon hardenability. No attempt has been made to show how hardenability data are used in particular industrial problems. Nevertheless, the facts have been compiled for a basic understanding of the elements of hardening.

•

HOW TO SUPERVISE PEOPLE—*By Alfred M. Cooper. Published by McGraw-Hill Book Company Inc., 330 W. 42nd St., New York 36, N.Y. 254 pages. Price $3.75.*

Methods outlined in this book are based on the views of thousands of experienced supervisors as expressed in foremanship-training conferences conducted by the author over a 25-year period. This third edition includes material on the effect of the Taft-Hartley law on supervision, a program for employee participation in management, and additional case examples, as well as basic material on getting out production, leadership, training, discipline and accident prevention.

•

GMELIN HANDBUCH "TITAN—SYSTEM NO. 41"—*American representative, D. R. Stein, 5 E. 57" St., New York, N. Y. 511 pages. Price $27.20.*

The pertinent world literature on titanium, up to Jan. 1, 1950, is contained in this new volume of a well-known handbook. It presents a complete review of the geology, geochemistry, metallurgy, chemistry, physics, and technology of titanium and its alloys and compounds.

The material is so arranged as to

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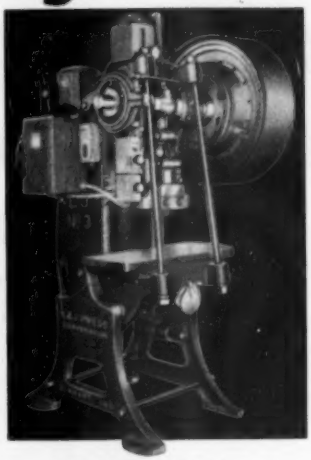

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Includes single stroke inching and continuous running. Also variable speed and automatic lubrication. 22 ton capacity, 2½" standard stroke, 8¼" or 10¼" die space (bed to slide, stroke down, adjustment up), 21¼" x 12¾" bolster plate area L. to R. x F. to B., 6¾" throat depth, 10" opening through back, 2,250 pounds net weight.

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WITH A NUCUT YOU FILE MORE, FASTER, BETTER WITH LESS EFFORT

NUCUT files are *different*. You can *see* the difference. Just hold the file at an angle—and you'll spot the exclusive wavy pattern made by NUCUT'S *two* sets of teeth. It's this patented wavy construction that gives you superior cutting power.

The teeth do two jobs at every stroke. The coarse teeth cut fast, clean, without skidding. The fine teeth leave the surface smooth. Just as if two files were working at every stroke.

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HELLER BROTHERS COMPANY
A New Jersey Corporation
America's Oldest File Manufacturer
NEWCOMERSTOWN, OHIO

Select right file for job. Files come in many different sizes, shapes, cuts and types. So, make sure you select the right file for the job.

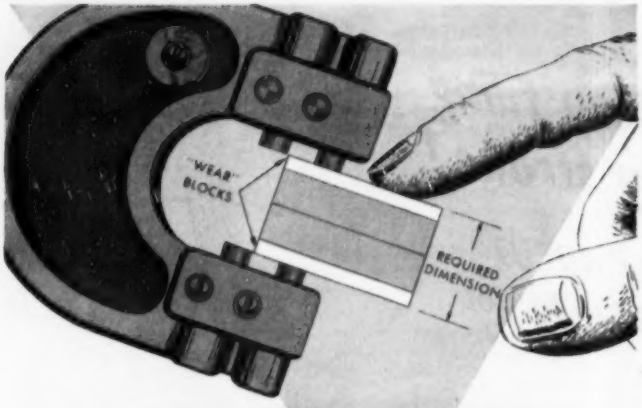
WRONG: Don't use a coarse file on fine work.

WRONG: Don't use a fine file on coarse, heavy work.

RIGHT: Fine work requires a fine file.

RIGHT: Coarse work should be handled with a coarse file.

CONTACT YOUR INDUSTRIAL DISTRIBUTOR for our FULL LINE of American Pattern, Swiss Pattern, Milled Curved-Tooth and Rotary Files, Rasps, Machinists' and Carpenters' Hammers, Blacksmiths' and Farriers' Tools, Bricklayers' and Plasterers' Trowels, Craftmaster Scrapers, Chisels, Punches, Masterenches and other quality tools.



GAGE BLOCK USERS NEEDED A Buffer TO ABSORB THIS WEAR

Though carefully heat treated and hardened, gage blocks do eventually wear out. A few blocks in each set absorb the bulk of the punishment. They are the blocks that are used repeatedly in fitting a build-up into the work.

Why not, reasoned Webber, add two blocks that can be used as buffers and thus spare the rest of the set. Webber pioneered the idea that was to be adopted by others later.

Today, in thousands of shops, a wear block is added to both ends of a build-up. They absorb the abrasion that would be spread over the entire set. Two blocks are worn out and replaced instead of a dozen or more.

The improvements made in gage blocks have made the name Webber synonymous with the best the industry offers. It is a direct result of devoting all of its attention to just one job. Webber has produced the first wear blocks, the first angle blocks, the first True-Square, the first precision taper inspection, the first Thermo-Guards as well as the first to simplify measurement in thermal expansion. Literature available. The Webber Gage Company, 12901 Triskett Rd., Cleveland 11, Ohio.

Webber did Something about it!

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GAGE BLOCKS

LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS

be readily available for consultation on any phase of the subject, and combines accuracy with completeness and conciseness.

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MACHINE DRAWING—*By Deane Lent, Asst. Prof. of Eng. Drawing, MIT. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. 530 pages. Price $5.85.*

Numerous interviews with employers of recently graduated engineers indicated a widespread weakness. These newcomers to engineering know how to draw and how to read drawings. But, they do not know *what* to draw. To be a good designer, one must be able to construct graphically an idea which will later be repeated mechanically, and will function as planned. Few engineering-school curricula provide sufficient time for thorough training in the machine-development processes.

This book is an attempt to fill the gap. Simulating the everyday practice of a company doing machine development, the book proceeds step by step through design, detail, and assembly. The importance of kinematics is outlined as a step in design, and then the subject is discussed more thoroughly further along in the book. Realizing an important need, the author devotes considerable space to manufacturing processes and the control of manufacturing accuracy, as they are reflected in design. In addition to the latter, there are chapters covering detail drawings, shape description, technical sketching, auxiliary and partial views, sectional views, symbols,

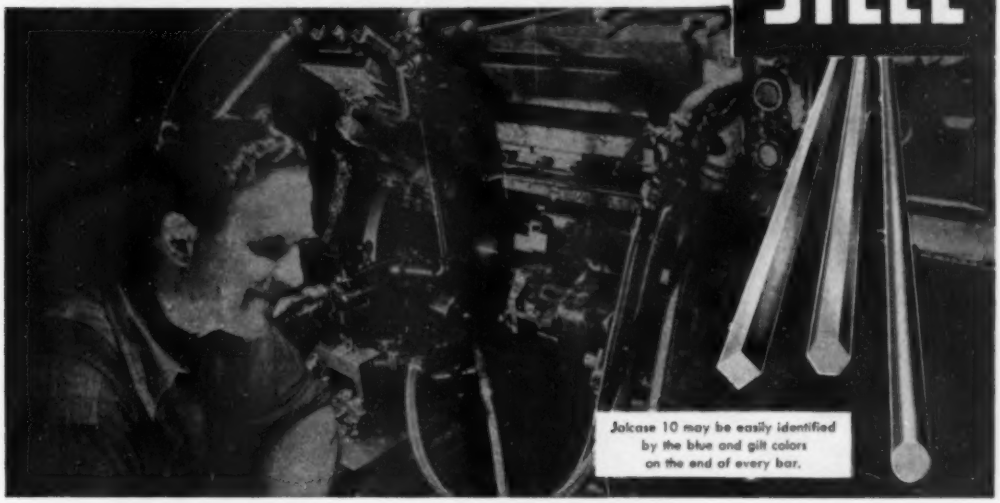
"Johnson's retiring and we're gonna need a lot of ice cubes!"

JALCASE 10 HELPS YOU

. . . eliminate a production step

. . . machine better cold-finished parts

J&L STEEL



Check these advantages of **JALCASE 10** *that offer you faster, more economical operations . . .*

NO HEAT-TREATING OF FINISHED PARTS REQUIRED

Many times finished part specifications on a job call for a high degree of hardness, but not as high as that obtained through heat-treating the finished part. In these applications, parts manufacturers and machinists have found it profitable to use Jalcase 10 and eliminate heat-treating altogether.

MINIMUM DISTORTION

Although Jalcase 10 is a high-carbon steel, distortion is cut to a minimum through special treatment during the cold-finishing process. As a result, when mechanical properties must be as high as possible and distortion held to a minimum, Jalcase 10 fulfills these rigid requirements.

HIGH MECHANICAL PROPERTIES

Jalcase 10 (A.I.S.I. No. C-1144) has the following cold-finished properties:

Minimum Tensile Strength	115,000 lb/sq. in.
Minimum Yield Strength	100,000 lb/sq. in.
Elongation in 2 inches	7% (minimum)
Reduction of area	20 %(minimum)
Brinell Hardness Range	235—285

PLUS . . . all the other advantages Jalcase steels have over ordinary screw stock:

1. lower cost per unit produced
2. finer finish on completed pieces
3. longer machine-tool life
4. less screw-machine down-time

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Send for our FREE booklet entitled "You Can Make Them Better with Cold-finished Jalcase." This illustrated booklet gives you complete technical information about *all ten* grades of Jalcase and how they can help you get better results in your machining operations. WRITE TODAY!

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TOOLS
In case after case it has been demonstrated that J. K. Smit diamond tools do have longer, more productive life.
Why?
Because, sixty-three years of experience in handling Industrial Diamonds has aided in developing Diamond Tools to their present high degree of utility. This improved Tool performance means economy.
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General Offices and Plant, Murray Hill, N. J.
J. K. SMIT & SONS of MICHIGAN
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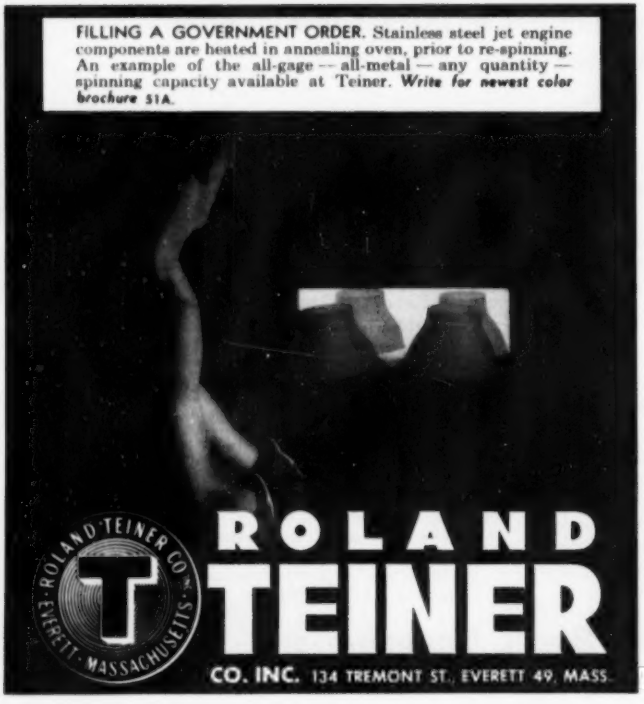
FILLING A GOVERNMENT ORDER. Stainless steel jet engine components are heated in annealing oven, prior to re-spinning. An example of the all-gage — all-metal — any quantity — spinning capacity available at Teiner. Write for newest color brochure 51A.
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dimensioning, precision drawing techniques, finished detail drawings, and assembly drawings.

The use of standard parts to simplify design and save manufacturing time is also discussed. A large number of practice problems are provided for student use, along with an extensive appendix of regularly required reference material. Full-size practice drawings are included.

Although this book is primarily a student text, it would be useful in the inner sanctums of "Design" as well. Draftsmen who have design ambitions should find it especially helpful.

•

BAND TOOL MANUAL—*Published by The DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. 160 pages. Price $2.*

Perhaps an alternate title for this manual might be "All You Need to Know About Band Tools." For in its relatively small compass it presents the machine operator, student, or production engineer with a comprehensive explanation of all the band tools used for sawing, slicing, filing, grinding, and polishing.

Extremely well illustrated with both photographs and line drawings, it defines band tool terminology, the 16 kinds of band tools, and their application to the machining of all kinds of materials.

Conventional low-speed machining, friction sawing, line grinding, band filing, and cutting of vitreous materials with diamond-tooth blades are only a few of the many applications shown. Specific information is given on the performance of the tools and their setup on the machine. Other information includes the characteristics of band tools, production rates, tool life, coolants and lubricants, surface finish, and dimensional

"Well, let's collect our thoughts and get back to work."

Why shoot birds... when there's b'ar around?

The few pennies you may save on initial cost for a lubricant are really *small game*. The *big savings*—such as reduced maintenance costs—come when you use Correct Lubrication!

For example . . . one plant, in the year following installation of a program of *Socony-Vacuum Correct Lubrication*, saved $66,000 on machine maintenance alone! In this same period, total cost of lubricants—including cutting oils—was only $50,000!

In addition to *maintenance* savings, Correct Lubrication also helps you achieve more continuous production, less power loss and lower over-all lubrication costs.

See what Correct Lubrication can do in *your* plant, mill or mine. Call your Socony-Vacuum representative today!

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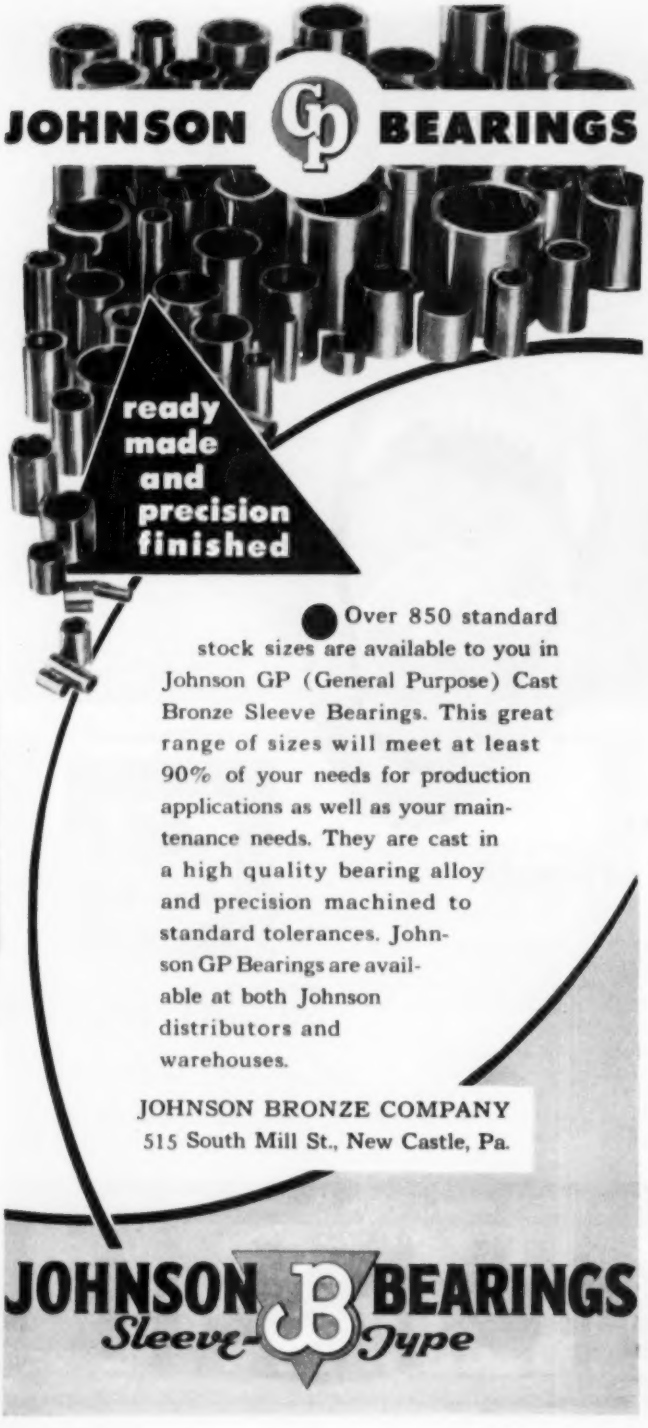
The Right Oils for Machine Tools, Presses...Every Machine in Your Shop

BACKED BY THE WORLD'S GREATEST LUBRICATION KNOWLEDGE AND ENGINEERING SERVICE


JOHNSON GP BEARINGS
ready made and precision finished
Over 850 standard stock sizes are available to you in Johnson GP (General Purpose) Cast Bronze Sleeve Bearings. This great range of sizes will meet at least 90% of your needs for production applications as well as your maintenance needs. They are cast in a high quality bearing alloy and precision machined to standard tolerances. Johnson GP Bearings are available at both Johnson distributors and warehouses.
JOHNSON BRONZE COMPANY
515 South Mill St., New Castle, Pa.
JOHNSON B BEARINGS
Sleeve-Type

accuracy. Also described are the care and selection of guides, butt welding of blades, and corrective measures for sawing problems.

One of the most useful sections is a series of 82 tool selection charts which give information on the selection of the kind of tool to be used, speed, pitch, feed, coolant, and other related factors for dozens of different materials, ranging from aluminum to wood.

•

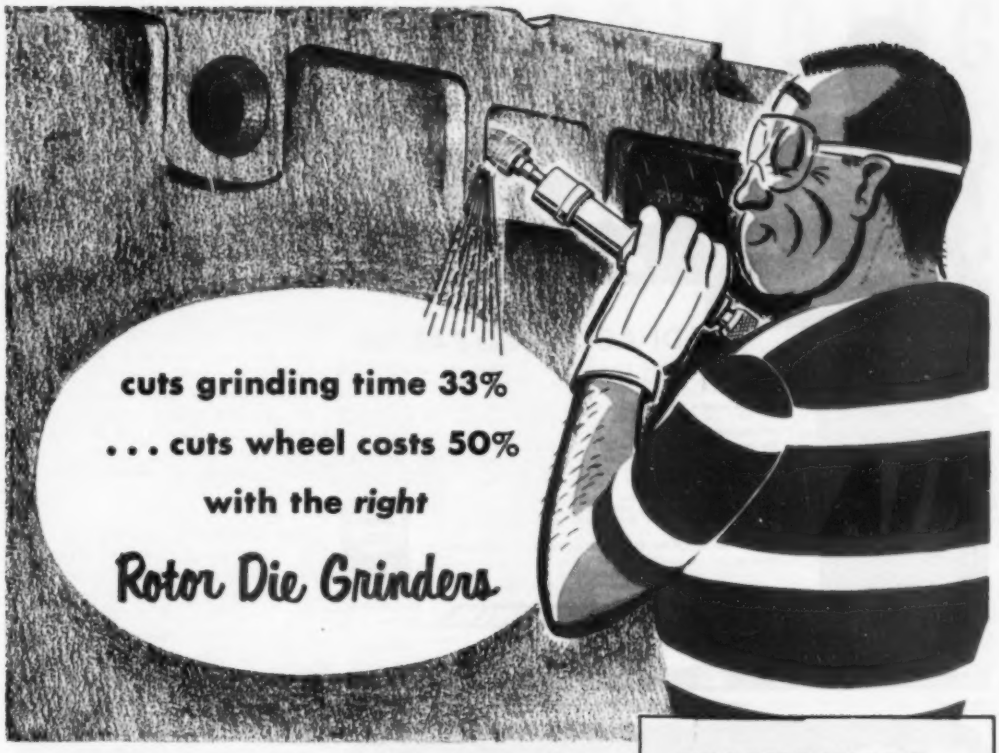
ELIAS E. RIES, INVENTOR—*By Estelle H. Ries (daughter). Published by Philosophical Library, 15 E 40th St., New York 16, N. Y. 369 pages. Price $4.75.*

The biography of almost any inventor of the past includes a normal amount of disappointments and disillusionments, but Ries' story is unusually full of bad luck, poor judgment, and failures. Although he invented a large number of devices that are in broad use today, he received little credit, and even less compensation. This book, while not living up to the usual story of inventive success, is a firm lesson to future inventors on how not to conduct their businesses.

Like any inventor, Ries thought up ideas that were useless at the time, but later turned out to be valuable. This is one of the lessons of invention—patience. The greatest inventors have all been ahead of their time; which is probably the reason that they are inventors, and not copiers. Ries also fell into a number of unfortunate business deals, depended upon a dishonest partner, and was generally overlooked by a public that benefited greatly from his work.

A generation after his death, Ries'

"I think I'll hire you—you look like you have a good honest face!"



HERE'S how Rotor Tool engineering assistance helped a New England manufacturer of large machine tools:

PROBLEM: Getting into recesses, corners, contours in large machine tool castings of high carbon steel. Finish was important. Used large cone wheels at 6000 R.P.M. Average weight of grinders was 12 to 13 lbs. Hard to control on small contours.

SOLUTION: Rotor Application Engineer recommended Rotor M-871 Short Spindle Die Grinder at 17,000 R.P.M., using small cone wheels. Tool weight is only 4 lbs. 10 oz., permitting faster, easier handling.

RESULTS: High-speed, light-weight Rotor Grinders have cut grinding time 33%. Saves 50% in wheel costs. Cut operator fatigue.

Rotor Application Engineers can demonstrate savings on *your* job. Write for Catalog No. 38.

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281 ROTOR MODELS...

The right grinder for your job!

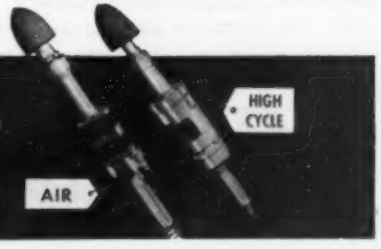
SPEEDS...21,000; 20,000; 17,000; 12,000 and 8,000 R.P.M.

COLLETS...¼"—⅛"—⅛"—½" (for abrasive sticks)

WHEEL ARBORS...For wheels ½" and ⅛" in thickness, cone wheel adapters—also extensions.

SPINDLES . . . Short and long spindles.

HANDLES...Lever, twist, snap and sleeve.



THE ROTOR TOOL CO.
CLEVELAND, OHIO

Precision
Rod Cutting
at High Speed

with the New
DI-ACRO ROD PARTER

The DI-ACRO Rod Parters further increase the applications of "DIE-LESS DUPLICATING" as a cost-cutting, time-saving production technique.

Do you require precision?—The DI-ACRO Rod Parters hold tolerance to .001" on duplicated cuts. The ends are square, and roundness is maintained.

Do you want speed?—The Rod Parters exceed output of other methods with equal accuracy, on rods and bars up to ½". Torrington Roller Bearings incorporated in an exclusive multiple leverage arrangement provide remarkable ease of operation in both heavy and light materials.

DI-ACRO Power Parter has air cylinder cushioned for quiet and efficient operation. Each cutting cycle obtained with 4-way foot valve—leaving operator's hands free.

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Shows parts produced without die expense by DI-ACRO Benders, Brakes, Shears, Rod Parters, Rollers, Notchers, Punches. Write today.

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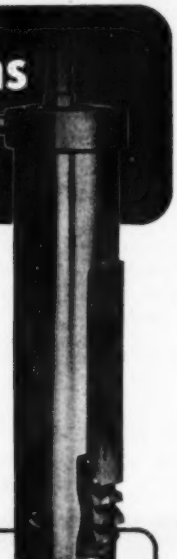
DI-ACRO POWER PARTER

10 Good Reasons

why YOU should use NATIONAL Keyseating Millers on your next job



They will mill keyseats:

- in one cut.
- in offset holes.
- that are straight.
- with parallel sides.
- partly through holes.
- for interchangeable parts.
- without clamping the work.
- of standard width and depth.
- in holes that are closed at one end.
- where keyseating machine can't reach.

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For Catalog No. 17
complete, handy size

followers have a somewhat different kind of life. Much research and invention, though not all, is done in company laboratories. While present-day inventors may not gather as much wealth from their work as Ries might have from his, they are subject to less disillusionment; especially so if they realize that a genius receives little extra, if any, compensation or acclaim for his enlarged mental capacity without a good press agent and business manager.

Ries' day was the day of the great expansion, unlimited empires in business, and rugged individualism. He was unfortunate in that he was unable to create an empire from his inventions, as he evidently wanted to do; but was even more unfortunate that the mode of the day made him feel his loss much more than he might in another time.

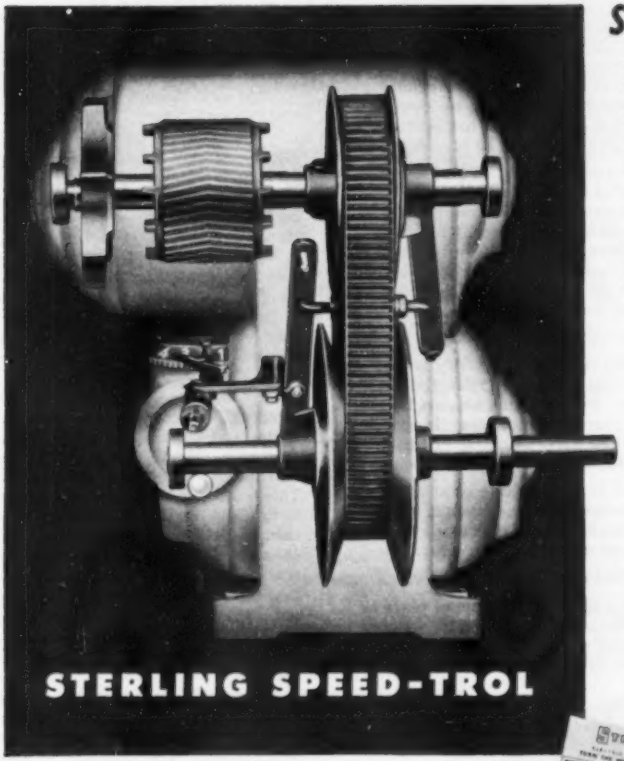
•

THE ENGINEERS' ILLUSTRATED THESAURUS—*By Herbert Herkimer. Published by The Chemical Publishing Co., Inc., 212 Fifth Ave., New York 10, N. Y. 572 pages, 5½ x 8 in. Price $6.*

Something over 8000 illustrations of machine elements and assembled machinery have here been pictured in classifications. The book has a uniform makeup: line drawings on the right, identifying data on the left. It is a lifelong collection of the author of all sorts of devices, providing the designer and the student with a handbook of design elements. All illustrations are indexed for convenience, but the arrangement makes finding a particular thing quite easy. Typical chapter headings include: fasteners, adjusting devices, supports

"I'm afraid I'll have to change jobs. All night long, I'm grinding my teeth."

A FINISH GRINDING OPERATION ELIMINATED BY



STERLING SPEED-TROL!

Speed-Trols on boring machines at Lear, Inc., Grand Rapids, Mich., resulted in elimination of a grinding operation and a reduction in manufacturing costs. This was accomplished through Speed-Trol's infinite speed adjustment and accurate speed regulation which allowed selection of the best cutting speeds for Carboloy or diamond tipped boring tools and boring to extremely close tolerances which obviated the need for a former final grinding operation.

STERLING SPEED-TROL GIVES YOU VARIABLE SPEED CONTROL NECESSARY FOR:

EQUIPMENT ADAPTATION TO: Sequence synchronization—operators' abilities—load variations due to differences in quantity, quality, weight, size, tension, hardness or shape of material to be processed, machined, conveyed, blended, mixed, etc.

PROCESS CONTROL OF: Temperature—viscosity—level—pressure—flow—etc.

TIME CONTROL OF: Baking—drying—heating—cooking—pasteurizing—soaking—chemical action—etc.

With Speed-Trol you get the maximum in production, plant efficiency, quality and profit.

OTHER STERLING ELECTRIC POWER DRIVES:
- **STERLING SLO-SPEED (GEARED) MOTORS**
- **STERLING KLOSD AND KLOSD-TITE (NORMAL SPEED) MOTORS**

DRIP-PROOF • SPLASH-PROOF • TOTALLY ENCLOSED

70 ILLUSTRATIONS showing how Sterling Electric Power Drives reduce production costs. Write for Bulletin No. B-100.

OUTSTANDING FEATURES:

Infinite speeds—positive speed regulation—fingertip control—large indicator—positive pulleys—no springs—belt tension in proportion to load—protected—streamlined—Herringbone Rotor—through ventilation—versatile mounting—NEMA dimensions—shock absorbing—quiet operation—rugged—compact—dependable—long life.

STERLING ELECTRIC MOTORS

Plants: New York City 51; Van Wert, Ohio; Los Angeles 22; Hamilton, Canada; Santiago, Chile.

Offices and distributors in all principal cities.

Vapor
FROM
Paper
STOPS RUST
In-Plant Storage is Made Clean, Easy, Effective!
In a matter of hours, rust was developing on these shiny stitching attachments in the Atlantic Coast plant of W. S. Bessett, Inc. Salt air and acid fumes from soldering operations made it doubly hard to prevent corrosion of parts in process.
"To keep labor costs down, we wanted to avoid refinishing precision parts that had been rust-free the night before" says Mr. Bessett. "When we heard of VPI, it was hard to believe that such an ordinary-looking scrap of paper could help".
That was several years ago.
Today Angier VPI Wrap is still the only protection required to keep "Bessett" attachments bright and rust-free in process. It protects finished parts in storage over weekends or for months on end.
Used as an envelope or as a liner for trays, bins or drawers, VPI gives off a vapor that stops rust No oil or grease is necessary.
There is no "cleaning" to do.
If you store or ship metal parts or products, get "VPI Facts" from Angier — the most experienced name in vapor rust preventives.
Angier VPI* WRAP
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Angier Corporation, Framingham 6, Mass.
Send "VPI Facts" as applied to:
Machinery-Industrial, Metal Working, Farm, Office, Construction.
Electrical Machinery, Appliances, Products.
Transportation Equipment — Auto, Aircraft, Naval, Railroad, etc.
Fabricated Products — Cutlery, Hardware, etc.
Steel in process of fabrication.
Ordnance Equipment.
Instruments and clocks.
Other.
Sign below, attach to your letterhead
* R. Vapor Rust Preventive

and structures, basic mechanical movements, transmission of liquids and gases, combustion, prime movers, industrial processes, and so on.

Here, at last, is the book of pictures for the neophyte in Metalworking,fi particularly lawyers, bankers, ad men, ordnance officials, and the like, with limited experience. It identifies shop elements and motions that now cause many mistakes in meaning.

•

DIE CASTING—*By H. H. Doehler, Chairman of the Board, Doehler-Jarvis Corp. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 510 pages. Price $8.*

Often, perhaps too often, there is a great overlapping or duplication of effort in the preparation of technical books. For the sake of better understanding or a clearer picture of the inter-relationship of processes, this does have value and cannot be avoided completely. Nevertheless one book discussing design, another text about production, and a third describing materials may all contain large portions of equivalent information.

Die Casting does not fall into this category. For many years, both Industry and Education have needed a thorough, detailed, authoritative text on this widely applied process. This book is it, prepared by a leader in the field. Of course, other publications have carried paragraphs and chapter and references, but nothing was available complete. Now, for the first time, the entire story is between two covers; a text for study or a ready-reference source. Here is complete coverage of every phase of die casting.

Chapters describe the components and operations of a variety of die-casting equipment, tracing historical development. Every aspect of die construction, from single-cavity designs to giant dies, is discussed. Design steps are described from selection of the parting line through section thickness, radii tolerances, and other details that determine success or failure. The advantages and disadvantages of die casting are analyzed, comparing it with other casting methods. Also covered are the requirements, compositions, and applications of both die steels and die-casting alloys.

More chapters on finishing, machining, trimming, and inspection include such topics as drilling, turning, and milling; finishes for zinc, aluminum, and magnesium; plus fixtures to perform simultaneous

AT WENDT-SONIS A LINDBERG INDUCTION HEATING UNIT

ups tool tip brazing 135% . . . replaces two units

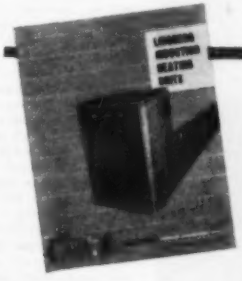
Production brazing of carbide tip tools has soared from 270 to more than 600 an hour since Wendt-Sonis, Hannibal, Mo., tool manufacturer, installed a Lindberg induction heating unit.

Two operators, fluxing parts and putting brazing metal and carbide tool tips in place, load the assemblies on a conveyor belt that passes a continuous stream of work through a specially designed, long hair-pin type heating coil.

Production is speeded because 14 tool assemblies . . . not just one . . . are in the heating field at any given time. The first tool on the conveyor passes *from* the heating area, leaving 13 others *still in* the field of heat, with tool number 15 *just entering* the coil area.

Production, formerly through two smaller units, totalled only 135 tools per hour, per unit, and required four operators. Thus the new equipment frees two operators for other important work.

If your requirements call for production brazing, soldering, hardening, annealing, stress relieving, hot forming, forging or shrink fitting, a Lindberg induction heating unit can better your production picture . . . minimize costs . . . increase profits.



Ask for a copy of Bulletin 1440. It pictures and describes standard models . . . illustrates 11 cost reducing features . . . lists applications . . . shows accessory equipment.

LINDBERG HIGH FREQUENCY DIVISION

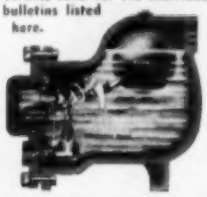
Lindberg Engineering Company, 2445 West Hubbard Street, Chicago 12, Illinois

Send for Nicholson Bulletins on These

3 WAYS TO SAVE TIME

in Production and Maintenance

On the basis of their time-saving records, leading shops are increasingly standardizing on these 3 Nicholson units. For details, send for the individual bulletins listed here.



NICHOLSON AIR TRAPS—For intercoolers, aftercoolers, receivers, tanks, etc. Feature non-plug and non-wire-drawing valve. Instantaneous operation and extra large drainage capacity effect fast, positive action. Catalog 751.

NICHOLSON CONTROL VALVES — Specially treated hard seats, wide choice of metals for specific mediums, and easy repacking cut maintenance time. Non-corrosive flat discs lap themselves on seats. Many leading plants have adopted Nicholson valves because of their longer leak-free service. 2-, 3-, 4-way and special types. All manner of operation. Size ¼" to 2½"; press. to 5000 lbs. Catalog 1250

NICHOLSON EXPANDING MANDRELS—Set of 14 does work of 209 solid arbors; sensational time savers in some operations. Sold singly or in sets; for bores ½" to 7". The standard in shops the nation over. Bulletin 750

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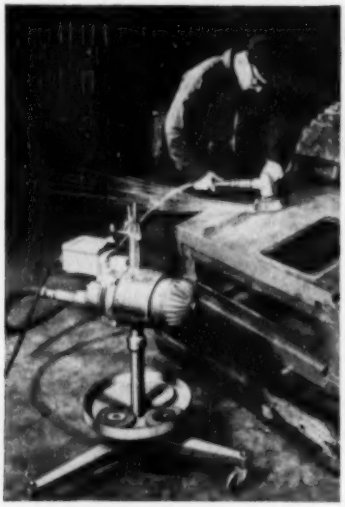
Less "Tool Handling"...More Production Means More Profit for You with MALL FLEXIBLE SHAFT MACHINES



Fast, lightest-weight power wherever you want it... vertically or horizontally. These are among the advantages of Mall units in dressing castings, grinding, drilling, buffing, sanding or polishing operations.

The Mall heavier-duty, constant speed motor gives you power reserve, nearly three times rated hp. on momentary overloads. Also, you get rugged machine construction. The shaft contains many layers of high carbon steel wire, wound under tension . . . treated to insure resilience. The strong spring steel liner of the housing provides a continuous shaft guide, preventing looping of shaft under load, protecting it from moisture, dust and injury.

Write for folder describing all Mall Flexible Shaft Machines.

40 Factory-Owned Service Warehouses, Coast To Coast, To Serve Our Customers and Thousands of Dealers

More power to the pound . . . less pounds to handle.

Mall TOOL COMPANY

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A 7066-¼

punching and trimming of castings. Especially valuable to management, there are sections on the estimation of die-casting costs and safety in the plant. The final chapter provides a glossary of widely used process terms, followed by an extensive index.

This book would be a valuable addition to most metalworking libraries, whether the user be student, designer, methods engineer, estimator, production engineer, or manager.

•

THE SCIENCE OF PRECISION MEASUREMENT—*By The DoAll Company, Des Plaines, Ill. 256 pages. Price $3.50*

This is a well-organized and extensively illustrated manual on the methods and devices employed for precision measurement in metalworking manufacture. Following a discussion of the principles of clearances and tolerances are chapters devoted to specific measuring equipment including gage blocks, sine bars, optical flats, electric comparators, and 3-wire thread measuring methods and wires. Each subject is covered clearly and the large number of helpful sketches and photographs are very effective in making the explanations easy to understand. The only faults to be found with this book are that it omits other precision measuring equipment not produced by DoAll, and, in several instances, direct reference is made to features of DoAll equipment. The very useful information that this book contains would have been better presented as a general text on precision measurement without reference to its commercial aspects.

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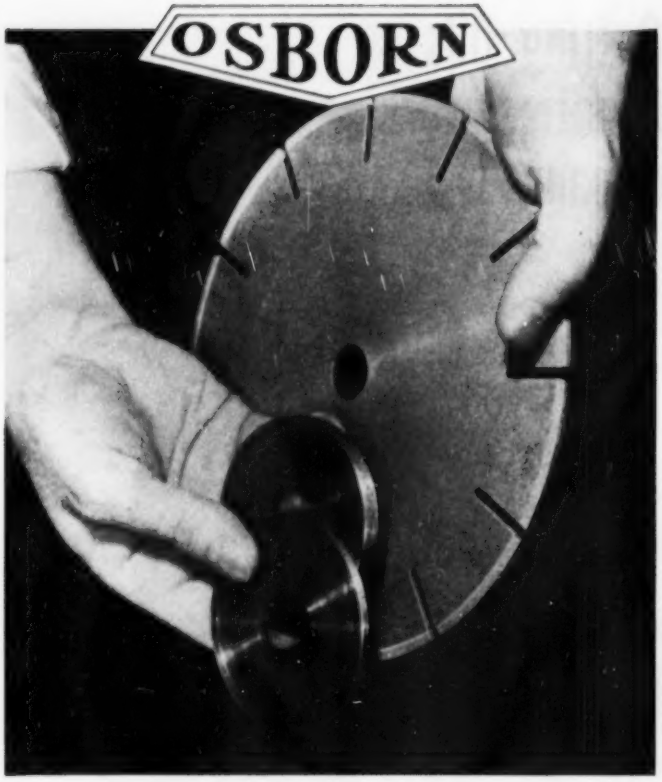
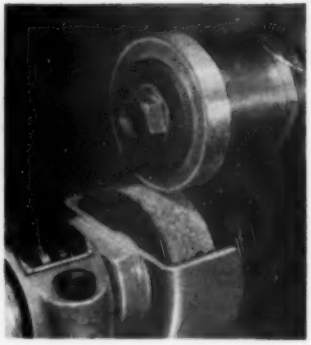




TRUE THE SURFACE. With this set-up true two diamond wheels at a time. Surfaces become uniform and perfectly flat. Usually takes about 15 to 30 minutes.

BRUSH THE MATRIX. Rotate the two wheels counter to rotation of Osborn wire wheel brush. This dressing removes some of the brass matrix. Leaves the diamonds exposed.

SEE THE DIFFERENCE. Two wheels on left show grooves before truing. Surface is arched. Two wheels on right have been trued and dressed. Dressing increased cutting action 80%.

Diamond-saving idea makes them do 80% more work!

Longer life and faster production from critically scarce industrial diamonds are being obtained by this method of dressing diamond wheels:

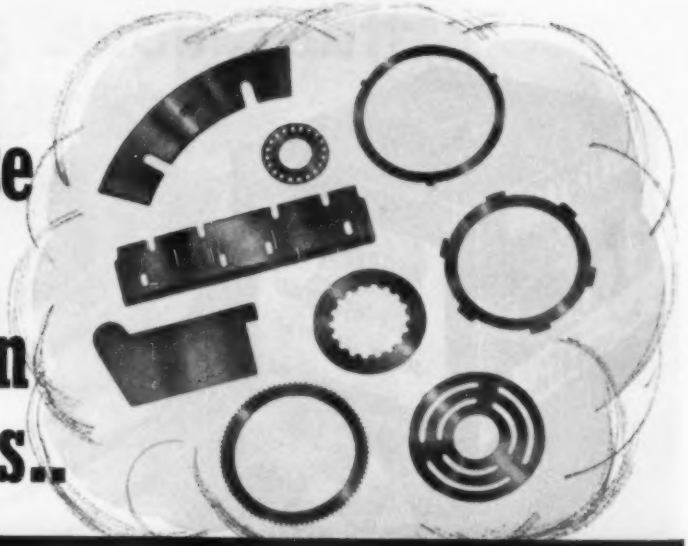
When wheels become grooved and out of square, true them by grinding, two at a time. After truing, mount wheels together in grinder and dress with counter-rotating 8-inch Osborn wire brush. This brushing removes some brass matrix, exposing the diamonds. One plant reports that this increases the wheel's cutting action 80%.

This is typical of many production aids available through your **O**sborn **B**rushing **A**nalyst. Call him today or write *The Osborn Manufacturing Company, Dept. 671, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

If Parts Like These are Production Headaches..



Heat Treated Discs — all types	Blades — All types — plain — toothed — beveled (For cutting or scraping)
Valve Discs (Compressors)	Circular Cutters for all types of cutting
Clutch Discs (Multiple Disc Type)	Irregular Shaped Cutters — All types
Aircraft Engine Discs	Heat Treated Liner Plates
Machine Parts (Flat Steel)	Rectangular Plates — All types
Wear Plates (Ways, etc.)	

If you're having difficulty manufacturing (or obtaining) any *FLAT STEEL PARTS* . . . especially parts that require heat treating and grinding . . . then here's your headache powder

Simonds Special Parts Division can be your production line for these parts . . . raw steel from Simonds Steel Mill in Lockport, N. Y., fabricated into your part at Simonds Famous Windowless Plant in Fitchburg, Mass.

Simonds Special Parts Division is fully equipped to produce precision parts for aircraft engines, printing presses, slitting machines, air compressors and numerous other applications.

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good judgment calls for
PARKER-KALON®
when good design calls for
SOCKET SCREWS

Your INDUSTRIAL SUPPLY DISTRIBUTOR— *your local source for P-K Socket Screws— works side by side with the P-K Assembly Engineer. Their combined efforts are solving many difficult problems of planning and procurement. Let them help you.*

Put a P-K Ground Thread Socket Set Screw among any comparable set screws. See how its super-smooth, gleaming surface shines out like the brightest star against a midnight sky.

Used in your product, it's a *star* salesman. Any buyer associates topmost quality with Parker-Kalon ground threads.

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SIZE-MARKED CAP SCREWS • GROUND THREAD SET SCREWS • FLAT HEAD CAP SCREWS • STRIPPER BOLTS • PIPE PLUGS • HEX KEYS

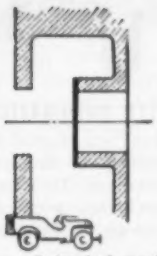
Automatic Recessing

the "Know-How" of grooving

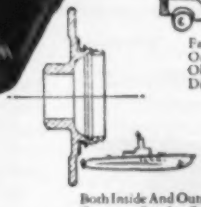
with SJ SCULLY-JONES

AUTOMATIC RECESSING TOOLS

They do these operations on standard drill presses, radial drills, turret lathes and chucking machines, as well as on special machines. A single recessing tool is easily adapted to do various operations or a combination of operations. Adjustments regulating location and depth of groove are simple, fast and accurate. Types "J" and "C" pilot in a fixture bushing. Type "R" pilots in, and stops on the work.



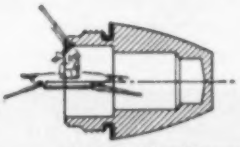
Facing An Internal Boss On Motor Castings Where Obstruction Usually Causes Difficulty.



Both Inside And Outside Clearance Grooves Cut In One Operation On Oil Tank Caps For Submarines.

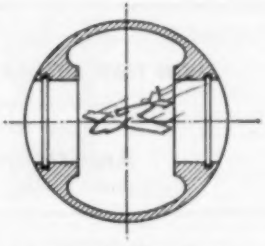
TYPICAL RECESSING-TOOL OPERATIONS

Formed Recesses Made In One Operation On Detonator Bushings Of Large Calibre Motorized Artillery Rifles.



Groove For Thread Clearance Cut On Anti-Aircraft Projectile With Automatic "Necking" Tool.

Casting Of Part For Army Tank On Which Two Recesses Are Made At One Time.



Snap-Ring Grooves Cut In Wrist Pin Hole Of Airplane Pistons.

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showing types, sizes, specifications and prices.

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

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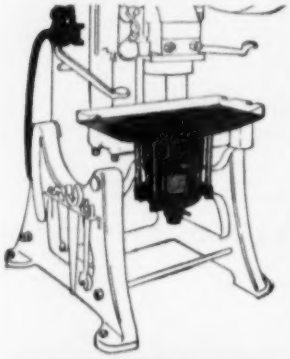
AT LOW COST

WITH PNEUMATIC DIE CUSHIONS

There is a Dayton Rogers Pneumatic Die Cushion for every punch press requirement. Uniform draw ring pressure for any specific draw is maintained through the use of a combination reducing regulator and gauge, making possible deeper draws for any one operation. They also provide a practical and accurate means of pressure pad control on most forming dies.



Dayton Rogers Pneumatic Die Cushions are recognized leaders in their field. There are well over 15,000 in use! Standard sizes for all inclinable presses are carried in stock for immediate delivery.

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Cost-cutting ideas for you . . .

HOW FORD AUTOMATES PRODUCTION LINES

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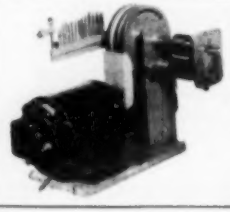

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FIELD SENSI-THREADER
Designed and built by a Machinist for:

. . . fast hand threading of holes in parts of all kinds, angles, bars, sheet metal, electrical fixtures of various materials, etc. . . . precision undersizing of threads to be electroplated. . . . chamfering, deburring, counter-sinking, stud threading, reaming and spot facing . . . left hand threading.

Made in three sizes and speeds.
Write for complete information.

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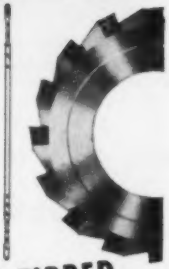
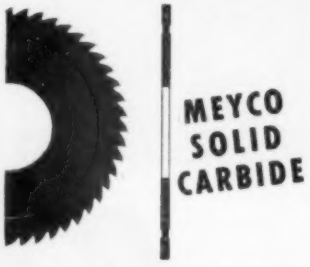


MEYCO CARBIDE TIPPED



MEYCO SOLID CARBIDE

MEYCO saws and cutters in various diameters and thicknesses can be furnished to your individual specifications. MEYCO cutters have earned an enviable reputation where long tool life and precision are a must.

Increase production in your slotting, venting and slitting operations by using MEYCO cutters. Please furnish complete specifications and quantities desired when requesting prices and indicate material to be cut.

Manufacturers of precision tools since 1888

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Cartridge renewals are cut at least *in half* when Cuno MICRO-KLEAN replaces any other filter. And throughout its service life, MICRO-KLEAN is *guaranteed* for specific performance.

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Fluid Conditioning

Removes More Sizes of Solids from More Kinds of Fluids

Strain fuels, lubricants, process fluids, etc.—AUTO-KLEAN
Filter fuels, lubricants, process fluids, etc.—MICRO-KLEAN
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The positive way to remove moisture and dirt from compressed air lines is to use the Cuno MICRO-KLEAN Air Line Filter.

This unique cartridge-type filter removes all entrained moisture, plus all foreign particles (dirt, pipe scale and other trash) down to 1 micron in size.

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Less Work for You

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The resin-impregnated fibres are non-wicking, so the trapped moisture drains promptly. The extra-large moisture-collecting area means less frequent draining.

Pressure drop across the cartridge is slight due to the openness of the structure—80 to 90% porosity—and to the absence of purely structural components (none needed) that offer resistance to flow.

A. Baffle deflects some moisture down outside cartridge.

B. Network of fibres catches remaining moisture and dirt as air works its way through interstices.

C. Trapped moisture drains into collection chamber.

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FOR FASTER PRODUCTION, BETTER WORK, LOWER COSTS—

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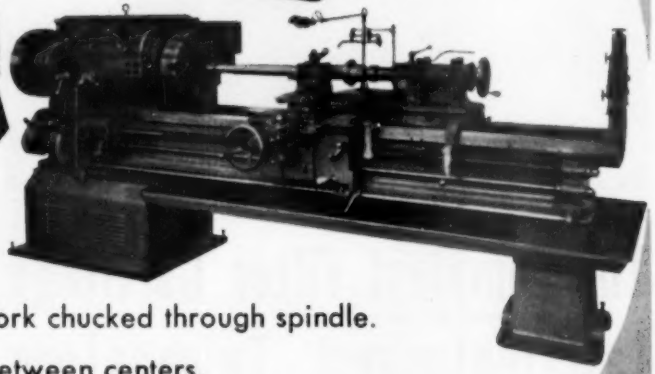
Large Hollow Spindle Type

Both Illustrations Show the 18" Hollow Spindle 7⅛" Hole

THEY'RE VERSATILE!



- Machine long work chucked through spindle.
- Machine work between centers.
- Also built with beds and carriages on each end of headstock for machining both ends of a shaft at one time.

SIZES 18" TO 36"

Small – 18" & 20" up to 7⅛" Hole
Medium – 25" up to 12" Hole
Large – 32" & 36" up to 16⅛" Hole
(Standard Type Lathes 16"-36")

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Hydraulic clutches for forward and reverse, controlled from apron or headstock.

Hydraulic brake for close position control.

Hydraulic clutches self-compensating. No adjustment and full power capacity at all times.

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these handles *Speed* production

UTICA TOOLS® are available with these special handles designed to increase comfort and efficiency. Additional cost is modest.

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Spring in handle opens jaws when pressure is relaxed. Spring can be provided separately or in combination with "Cushion Grip" dipped plastic handles.

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"Cushion Grip" dipped soft plastic handles give extra comfort. Particularly effective for women operators on production lines. Standard colors are red, blue and black.

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Red plastic handles with deep knurling for a positive but comfortable grip. Non-burning and non-explosive they will stand up under extreme temperature changes. Easily applied — "just hammer them on."

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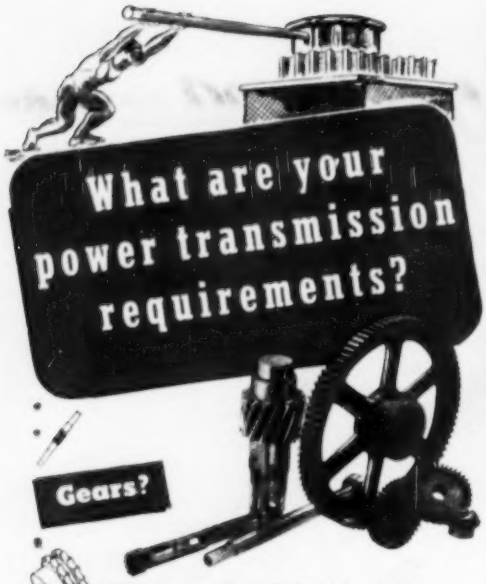
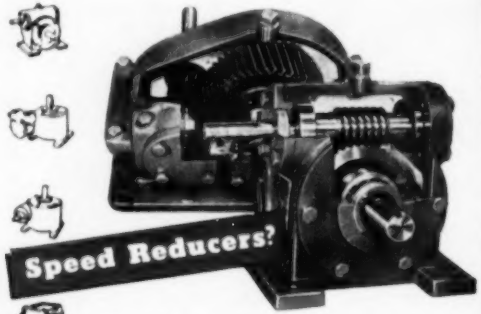


Chances are you'll find the gear you want available from Grant's mammoth stock. If not, complete facilities are available to cut all types. Deliveries made on your schedule.



Worm, double worm, compound worm and spur, helical, mitre gear — Grant makes them all . . . reductions up to 3660-1 . . . most types available from stock.

75th ANNIVERSARY

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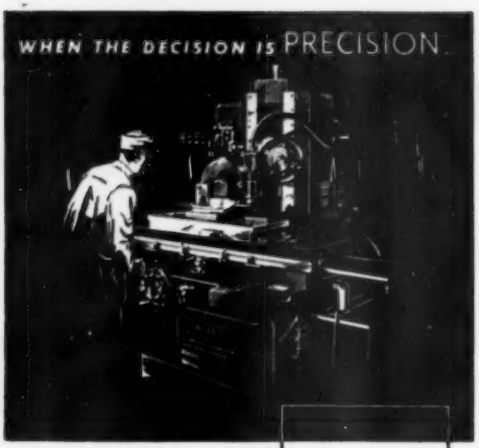

Where extreme tolerances are not required, the choice of any particular grinding machine may not be too important. Where absolute precision is demanded, the choice is usually *Grand Rapids*.

Defense orders make it impossible to fill orders as quickly as we desire—but we know our customers can appreciate the reasons for delay. As always we'll do our best to serve you.

GALLMEYER & LIVINGSTON CO.
220 Straight Ave. • Grand Rapids, Mich.

Grand Rapids Grinders
—World's finest

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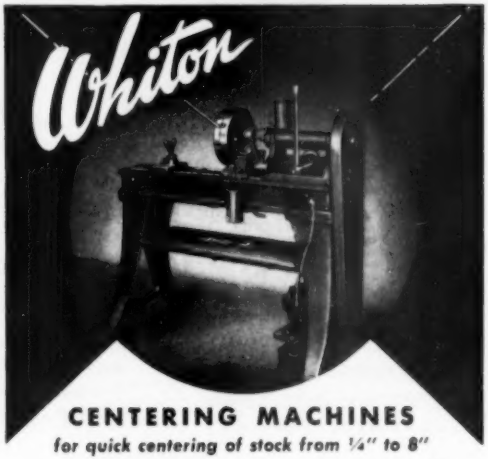

CENTERING MACHINES

for quick centering of stock from ¼" to 8"

3 or 4 jaw lever operated universal chucks center and hold work. A standard tapered hole in the spindle provides for holding combination or twist drills of suitable size. Spindle traverse is actuated by a feed lever. Machine is completely motorized. Also available are single spindle single head screw feed floor and bench types as well as single spindle double head centering machines. Write for Bulletin C-1 now.

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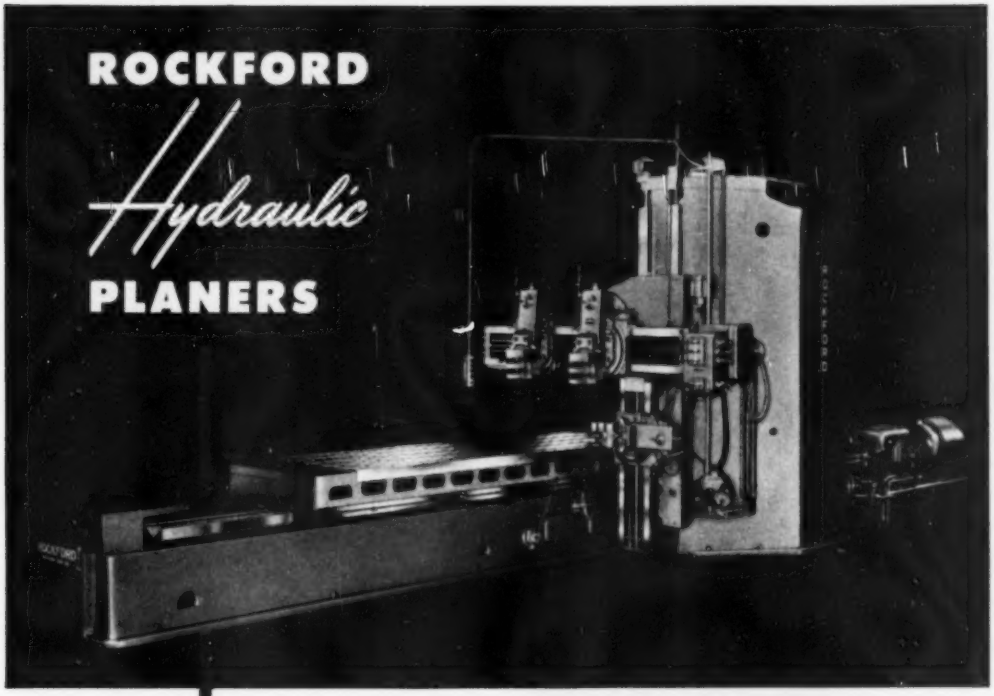
Steam Turbines

ROCKFORD *Hydraulic* PLANERS



SIMPLIFIED CONTROLS

HYDRAULIC DRIVE

DESIGN FOR SPEED AND ACCURACY

NEW ANNIVERSARY MODELS FOR GREATER PRECISION, HEAVIER CUTS AND MORE EXTENSIVE USE OF CARBIDE TOOLS

These new Anniversary-Model Rockford Hydraulic Planers are designed and built for maximum production efficiency and use of new types of alloy and carbide cutting tools.

Table, bed and column are newly designed to withstand heavier cutting pressures. New column, with six-foot cross section and increased bearing on bed, assures accuracy.

Exclusive L-type cross-rail construction affords maximum bearing on column with resulting rigidity. Adjustable side-head rail assures accurate and permanent alignment of side head with rail heads.

Be sure to get all the facts on efficiency, ease of handling and new design features of Rockford Hydraulic Planers. Use them as a guide for reduced machining time and costs on all planer work.

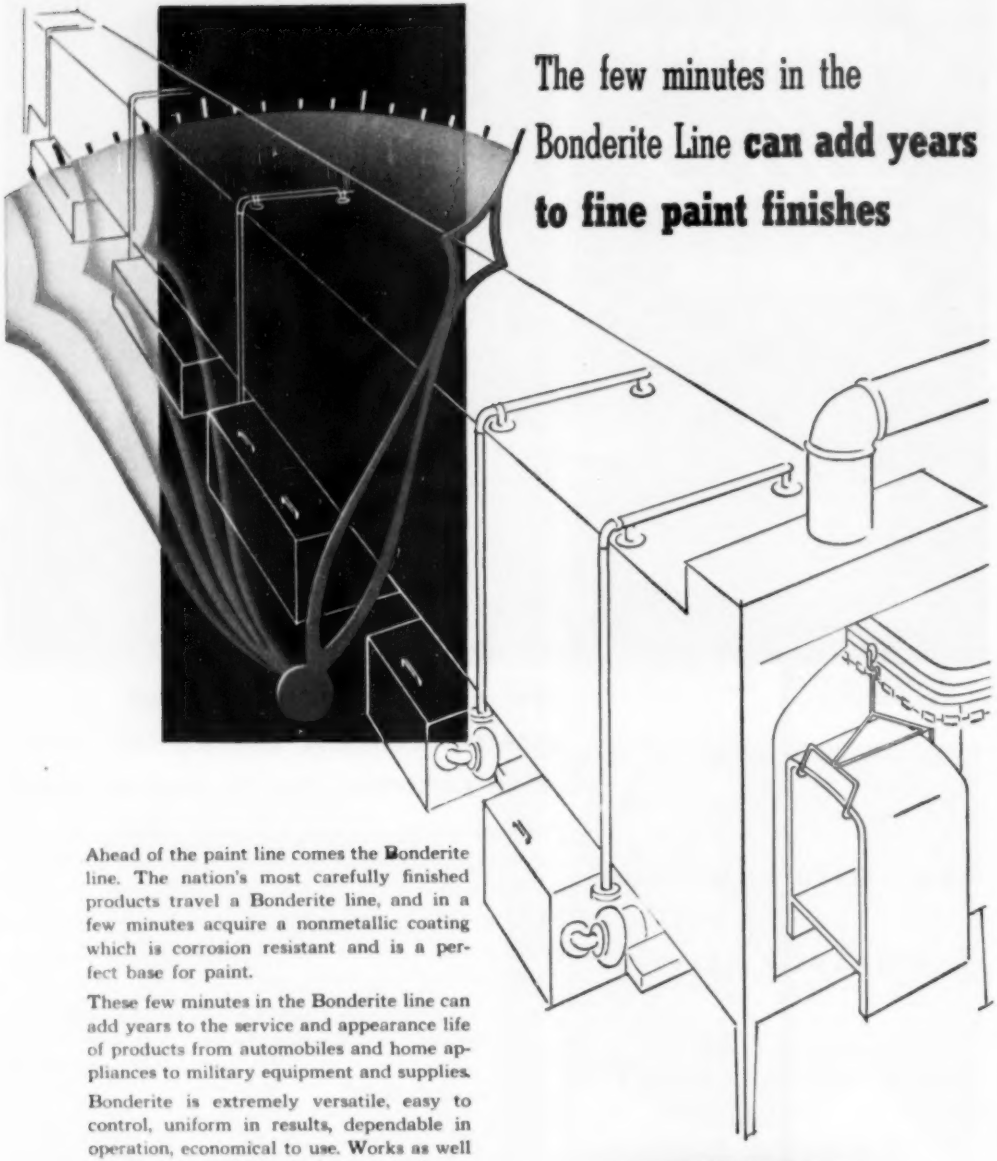
Write for Bulletin 450A

Hy-Draulic

50th Anniversary

ROCKFORD MACHINE TOOL CO.

2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS



The few minutes in the Bonderite Line **can add years to fine paint finishes**

Ahead of the paint line comes the Bonderite line. The nation's most carefully finished products travel a Bonderite line, and in a few minutes acquire a nonmetallic coating which is corrosion resistant and is a perfect base for paint.

These few minutes in the Bonderite line can add years to the service and appearance life of products from automobiles and home appliances to military equipment and supplies.

Bonderite is extremely versatile, easy to control, uniform in results, dependable in operation, economical to use. Works as well in immersion tanks for limited production as on the largest mass production lines.

Get complete information on Bonderite now. Write today!

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Parker Rust Proof Company
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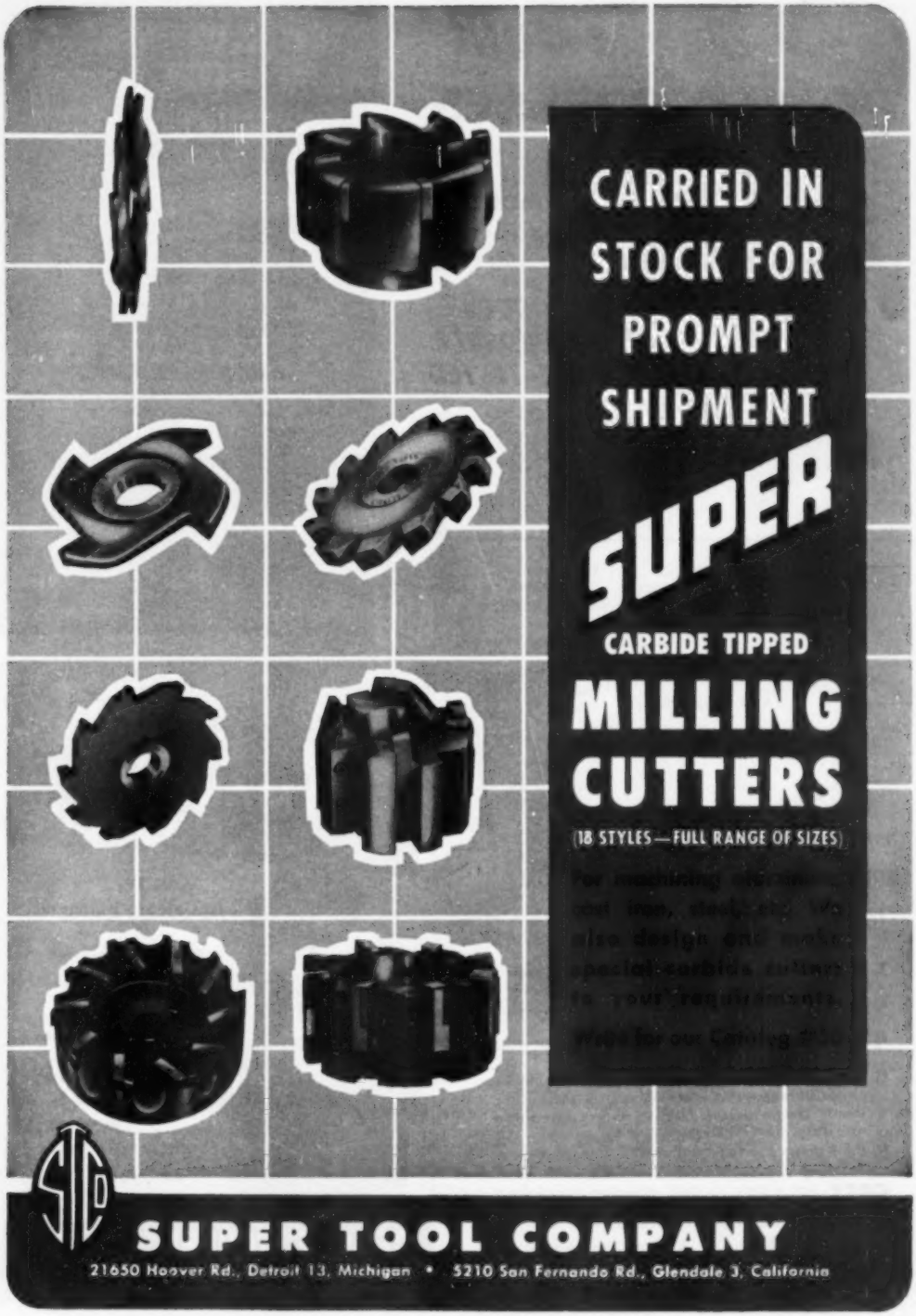
***BONDERITE**—corrosion resistant paint base*

***BONDERITE** and **BONDERLUBE**—aids in cold forming of metals*

***PARCO COMPOUND**—rust resistant*

***PARCO LUBRITE**—wear resistant for friction surfaces*

**Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.*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CARBIDE TIPPED
MILLING
CUTTERS
(18 STYLES—FULL RANGE OF SIZES)
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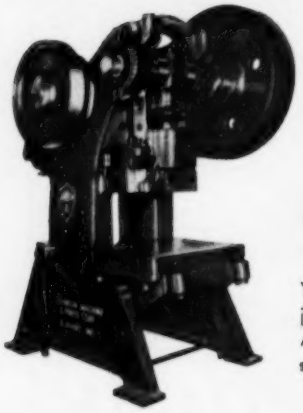
JOHNSON **Bonus Built**

POWER PRESSES



15 MODELS
CAPACITIES OF
16 to 90 Tons

RUGGED DEPENDABLE TIME-TESTED

You can handle larger jobs on smaller presses. Ask about the extra safety features.

Write for Bulletin 52 . . . a complete description of all Johnson's 15 models. Request data sheet on the Hydra-Shear.

NEW . . . DIFFERENT . . . AND BETTER for real production shearing

the **HYDRA-SHEAR**

to handle up to 10 gauge in 6' - 8' - 10' lengths. No gears or clutch . . . Overload hazards eliminated . . . Lessens curl and burring.

Johnson Machine and Press Corp.

620 W. INDIANA AVE. ELKHART, INDIANA

HAVE YOU TAKEN THE FOUR GOOD STEPS? *See page 6*

This FREE New Booklet Tells You How

In its 28 illustrated pages you'll find the answers to many questions that affect the success of your electroplating on steel. You'll want to read more about:

- ¶ Which costs more: good electrocleaning or poor electrocleaning? *See page 4.*
- ¶ How can cleaning costs be reduced 33⅓% while plating quality is being improved? *See pages 7 and 8.*
- ¶ What are four easy ways to improve the average rinse tank? *See page 10.*
- ¶ What rinsing fault is "an invitation to trouble" in the plating of high-carbon steel? *See page 11.*
- ¶ Why is it better to clean steel with reverse current than with direct current? *See pages 12 to 14.*
- ¶ What causes hydrogen embrittlement during electrocleaning? What is the remedy? *See pages 15 and 16.*

FREE For a copy of *"Four good steps toward better electroplating on steel"*, write to Oakite Products, Inc., 24 Thames St., New York 6, N. Y.

Technical Service Representatives in Principal Cities of U. S. & Canada

OAKITE SPECIALIZED INDUSTRIAL CLEANING MATERIALS · METHODS · SERVICE

Simplified **LEITZ TOOLMAKERS MICROSCOPE**

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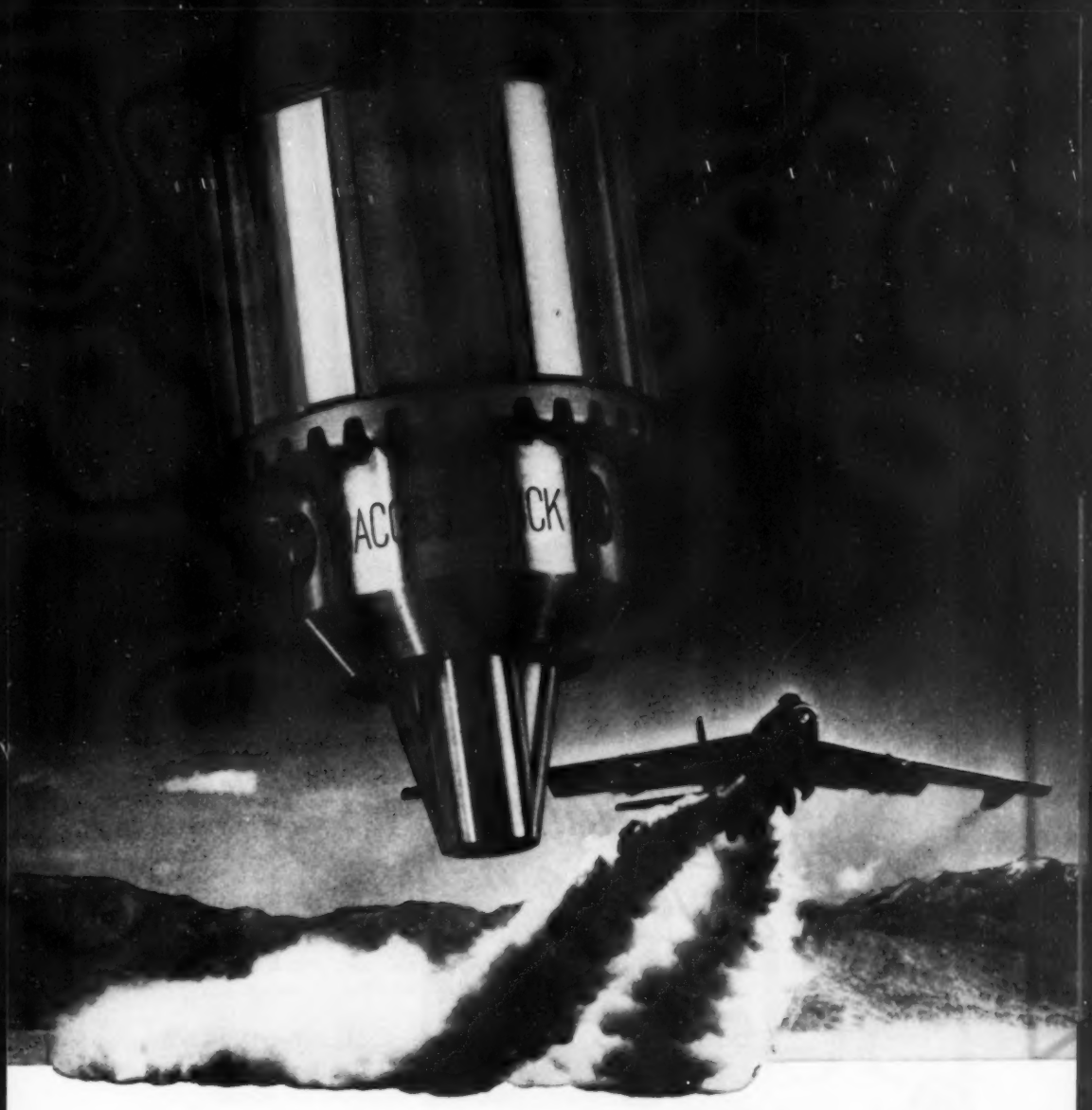
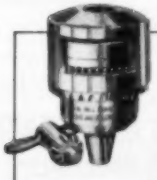


EXTRA POWER *for top performance*

In A Jet Plane, rockets supply the extra launching power needed for fast-climbing takeoff. In industry, Jacobs Plain Bearing Chucks supply the extra gripping power vital to top performance in light- and medium-duty drilling. This, plus rugged construction and precision accuracy, makes them the world's most widely used chucks.

Jacobs Chucks are stocked and sold by your Industrial Supply Distributor.

The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

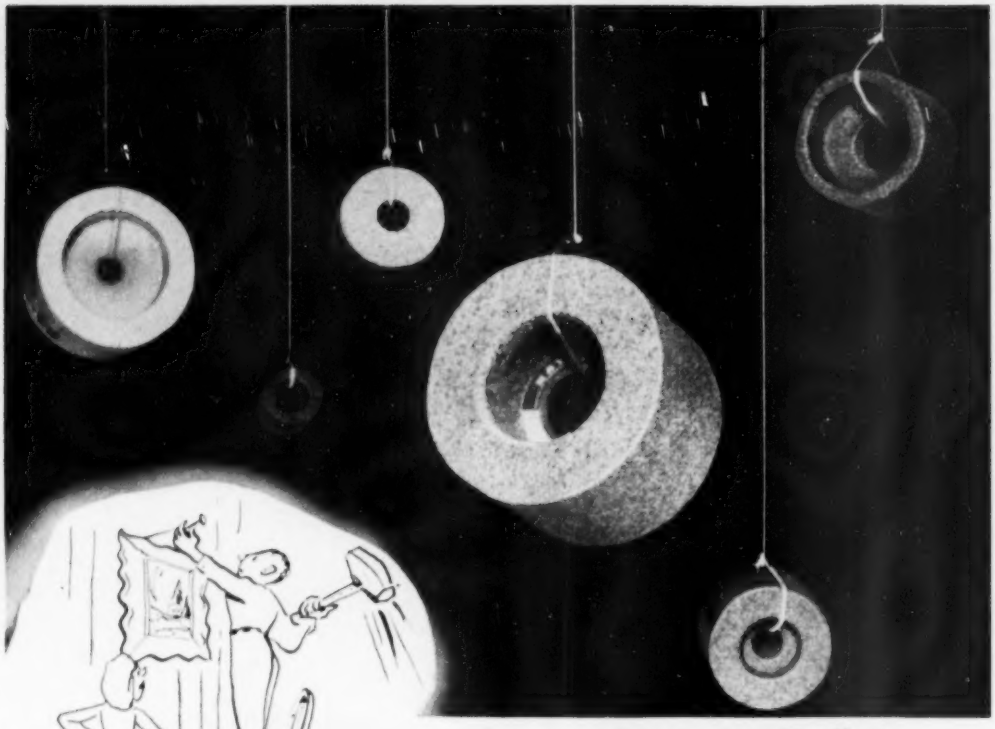


The Jacobs Ball Bearing Super Chuck, designed particularly for heavy-duty drilling, has the most powerful grip ever developed in drill chuck history.

IF IT'S A

JACOBS

IT HOLDS



YOU COULD HANG PICTURES with a sledge hammer...

but . . . you shouldn't — nor should you use just any internal grinding wheel when you can use Bay State's . . . proven best in the field for the countless inside grinding jobs that call for speed and accuracy.

Deservedly popular, Bay State Internal Grinding Wheels are:

- **UNIFORM** — due to exacting standards of manufacture
- **TRUE-RUNNING** — because of accurate centering
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BAY STATE ABRASIVE PRODUCTS CO.
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BAY STATE'S current expansion program includes a new 250 foot kiln plus a 30% increase in plant capacity . . . this means better deliveries to you.

big swing $ big value

Nebel engine lathes

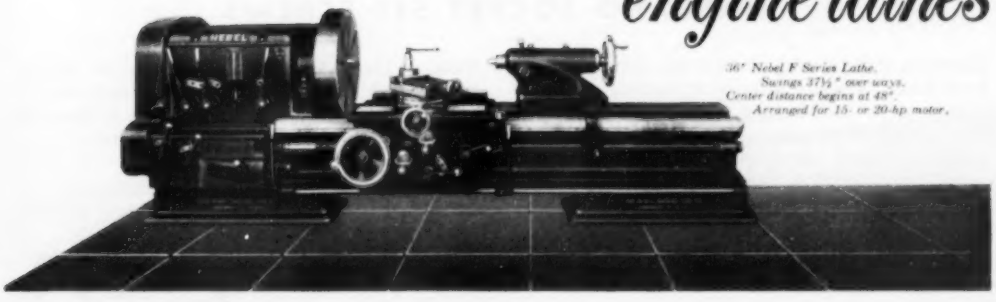
WHEN YOU BUY A LATHE that will swing 37½" over the ways, you're usually in for a whopping big investment.

Not so with the Nebel 36" F Series heavy duty engine lathe. Although this industrial giant gives you *big swing capacity* . . . with *power* and *speed* to match . . . it costs you several thousand dollars less than the nearest competitor.

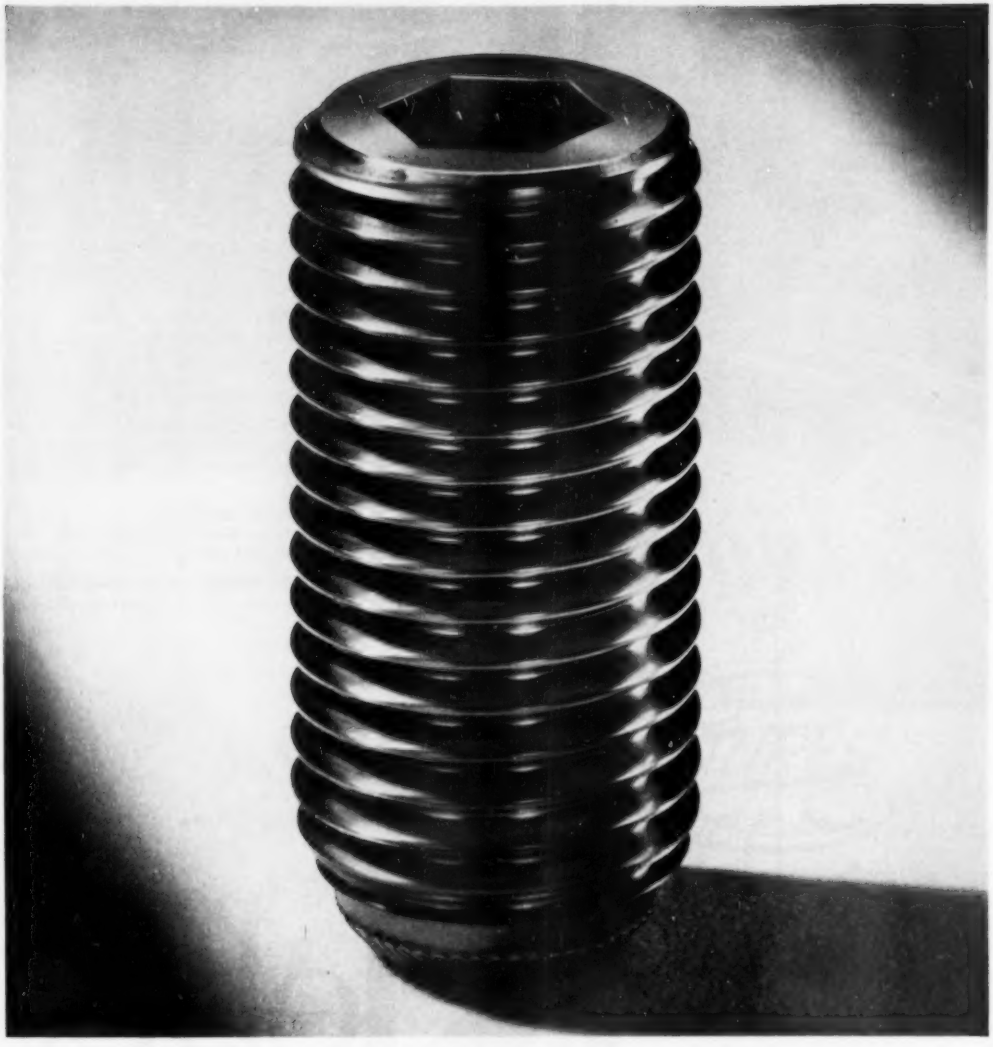
REASON: IT'S A BASIC LATHE . . . with all unnecessary "extras" eliminated . . . simplified to meet every day essentials. You can't afford *not* to buy Nebel.

For complete information on the Nebel F Series, or any other Nebel engine, removable block gap or extension bed gap lathe . . . write today.

THE NEBEL MACHINE TOOL CO., CINCINNATI 25, OHIO, U. S. A.
fine lathes at modest cost since 1899.



36" Nebel F Series Lathe.
Swings 37½" over ways.
Center distance begins at 48".
Arranged for 15- or 20-hp motor.



For positive, vibration-resistant SELF-LOCKING UNBRAKO SOCKET SET SCREWS

UNBRAKO Self-Locking Socket Set Screws won't work loose. Non-slip internal wrenching provides positive drive. Self-locking feature prevents creep and subsequent loosening. Machinery stoppage and production losses are materially reduced. Write for descriptive literature. STANDARD PRESSED STEEL Co., Jenkintown 1, Pennsylvania.

Standard UNBRAKO *Self-Locking Set Screws, #4 to 1" inclusive, are available from your* UNBRAKO *distributor's stocks. Ask him for your supply of these and other* UNBRAKO *threaded industrial fasteners.*

SPS JENKINTOWN, PENNSYLVANIA

UNBRAKO® SOCKET SCREW DIVISION

CAP SCREWS • SET SCREWS • SHOULDER SCREWS • DOWEL PINS • PRESSURE PLUGS

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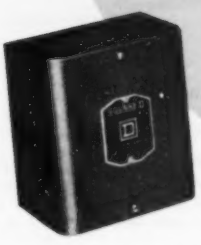
DESIGN LEADERSHIP*

SQUARE D's NEW MAGNET-OPERATED VALVE

ROTARY MOTION



FOUR-WAY
3/8" or 1/2" PIPE

Fast Operation—Direct-acting magnet . . . low inertia . . . up to 1200 cycles per minute on intermittent duty basis.

Low Pressure Drop—Internal cross-sectional area greater than 3/8" pipe area . . . minimum resistance to flow.

Long Life—Pressure-balanced rotor . . . manganese-bronze valve body . . . hardened magnet parts . . . bronze OILITE pivot bearings.

Low Power Consumption—Magnet coil requirement 38 VA at 60 cycles—inrush 215 VA.

Compact—Unique valve design permits small magnet structure . . . overall valve size only 5 1/8" x 6 1/2" x 4".

Accessible—Valve body or magnet structure removable without disturbing pipe connections . . . magnet coil easily changed.

Easy Installation—Valve mounts in any position . . . cast base with 3-point mounting reduces distortion possibility.

Pressure Range—Efficient operation on air pressures up to 100 p.s.i.

Write for Bulletin 9043 Type C, Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin

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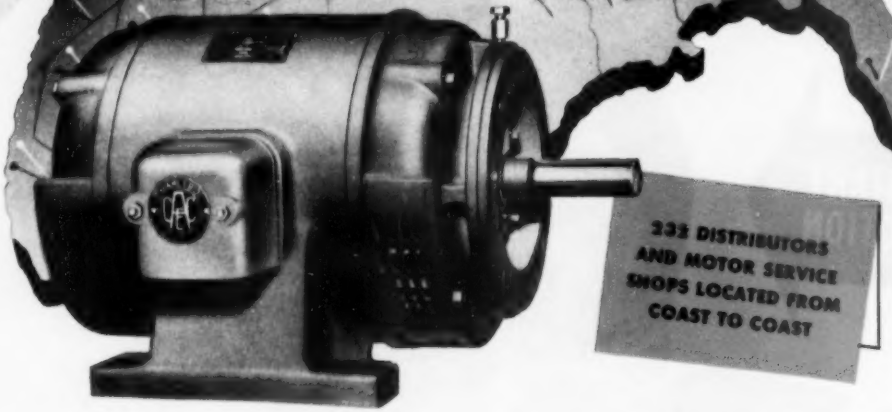
SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

ACEC SERVICE COVERS THE NATION



NOW ON HAND

Integral Horsepower Electric Motors—conforming strictly to NEMA SPECIFICATIONS
FULLY GUARANTEED

AVAILABLE IN THE FOLLOWING TYPES:

- ★ **Open Drip Proof Motors**
- ★ **Totally Enclosed Fan Cooled Motors**
- ★ **Pump Motors:**
  - Style "C" Face Mounted
  - Style "P" Vertical Solid Shaft
  - Vertical Hollow Shaft
- ★ **Adjustable Speed Schrage Motors**

MOTORS EXCEEDING 200 HP. BUILT TO ORDER

Today, world-famous ACEC electric motors are not only *immediately available* to American customers from warehouses in the United States, but ACEC SERVICE is available from Maine to California, from Washington to Florida.

232 DISTRIBUTORS AND MOTOR SERVICE SHOPS, throughout the nation, are fulfilling the service requirements of ACEC customers promptly and efficiently. *Every* user of ACEC products has the assurance that he can call upon skilled, dependable workmanship to maintain his equipment in perfect running order.

As a designer and manufacturer of electric motors, ACEC has established a world-wide reputation for excellence, and it is the set policy of the management that in matters of performance, promptitude, and courtesy the ACEC SERVICE DIVISION shall continue *unsurpassed*.

Whatever your electric motor requirements, write, wire, or telephone the nearest ACEC office or representative — or communicate directly with us in New York. Inquiries and orders receive immediate attention.

IMMEDIATE DELIVERY from NEW YORK • CHICAGO • KANSAS CITY • NEW ORLEANS • DALLAS and LOS ANGELES Warehouses

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VAPOR DEGREASING
meets aircraft industry's demand for
FAST, EFFICIENT METAL CLEANING

For peak efficiency in metal cleaning use DU PONT "TRICLENE" D

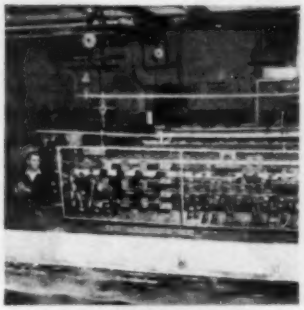
TRICHLORETHYLENE

"Trichlene" D Trichlorethylene is the ideal solvent for vapor degreasing. Developed by Du Pont after years of research, it is non-flammable, stable and pure . . . stands up under moisture, air, heat and other destructive influences . . . and can be readily recovered for economical re-use. In short, "Trichlene" D possesses *all* of the properties needed for the efficient and economical operation of a modern degreasing installation.

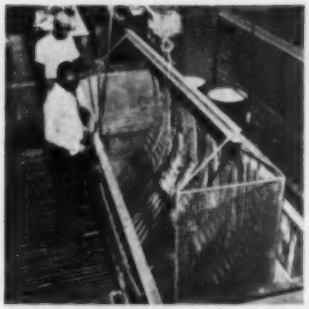
"Perclene" Perchlorethylene—another Du Pont solvent for vapor degreasing—is particularly suitable for operations requiring a high-boiling solvent. Like "Trichlene" D, "Perclene" is a non-flammable, synthetic solvent of high purity.

DU PONT TECHNICAL SERVICE

A call to your Du Pont Solvent Distributor will bring prompt, practical advice from experienced technicians in the metal cleaning field. They'll be glad to tell you about "Trichlene" D or "Perclene" and assist you on metal cleaning problems.



SMALL AIRCRAFT PARTS are vapor degreased prior to plating for thorough removal of cutting compounds. Compact vapor degreasing equipment is economical to use, simple to operate, easy to maintain.



ALUMINUM "SKIN" SECTIONS emerge thoroughly cleaned, instantly ready for the next process. Vapor degreasing cleans sections of any size or shape . . . saves time and cost in subsequent handling and finishing.

Speed and efficiency in metal cleaning are essential to production in modern aircraft plants. Vapor degreasing with Du Pont "Trichlene" D Trichlorethylene meets these requirements . . . removes lubricants, quenching oils and protective grease from all types of aircraft tubing, machined parts and sheet metal sections. Parts come out thoroughly cleaned—usually in less than a minute!

Compact vapor degreasing equipment requires a minimum of valuable floor space in today's "stepped-up" production lines. Units handle a variety of different parts . . . can be adapted to manual or mechanized operation. The final cleaning step in each unit—passing the parts through pure "Trichlene" D vapors—leaves each piece clean, warm and dry, ready for assembly or further processing. And cleaning costs remain low, since a large part of the contaminated solvent is recovered for economical re-use.

Perhaps vapor degreasing can mean increased efficiency in *your* metal cleaning program. The coupon below will bring you complete information.

Mail this coupon for facts on vapor degreasing

non-
DU PONT *flammable* SOLVENTS for VAPOR DEGREASING
SOLD NATIONALLY THROUGH DISTRIBUTORS

DU PONT
REG. U.S. PAT. OFF.

150th Anniversary
BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.)
Electrochemicals Dept., Wilmington 98, Delaware

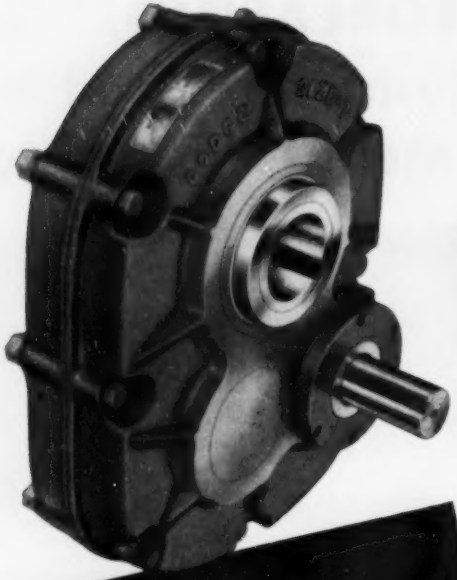
Please send me detailed information on Vapor Degreasing: applications, advantages, equipment used, and Du Pont solvents available. We are interested in cleaning _____ products.

*Name*_____ *Position*_____

*Firm*_____

*Street and No.*_____

*City*_____ *State*_____



A NEW SIZE!

43 H.P.

DODGE TORQUE-ARM

The Speed Reducer that saves you real money!

Here it is—the big size that enthusiastic Torque-Arm users have been asking for! Engineered for the same dependable performance and same economy that have made Dodge Torque-Arm Speed Reducers a nation-wide sensation.

- The new "big brother" of the famous Torque-Arm family. Double reduction. 43 hp capacity. Output speeds from 12 to 110 rpm.
- Rugged. Dependable. *Economical.* No special engineering required. No foundation to provide. No flexible couplings. No "lining up" difficulties. No expensive installation.
- Stock TAPER-LOCK sheaves prescribed for each job provide desired speeds. Applications to other machines is practical and easy.
- Unit is driven through any V-belt drive. A torque arm, fastened to any fixed object, anchors the reducer unit. Turnbuckle provides fast and accurate adjustment of belt tension.
- Backstop available from stock when required. Easily installed. Sealed and lubricated inside reducer housing.
- Dodge Tri-Matic Overload Release, which provides positive protection for driven machines both mechanically and electrically, is available from stock.
- Dodge Torque-Arm Speed Reducers are built in two series—Single and Double Reduction. Eleven sizes in all, with capacities from 1 to 43 hp and output speeds from 13 to 333 rpm. All available from distributors' stocks.
- WRITE for special Torque-Arm bulletin.

DODGE MANUFACTURING CORPORATION
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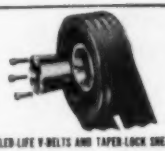
DODGE

of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new cost-saving methods. Look for his name under "Power Transmission Equipment" in your classified phone book.



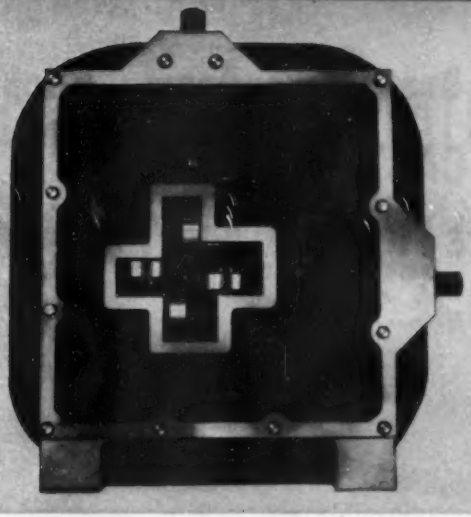
SEALED-LIFE V-BELTS AND TAPER-LOCK SHEAVES

DODGE-TIMKEN PILLOW BLOCKS

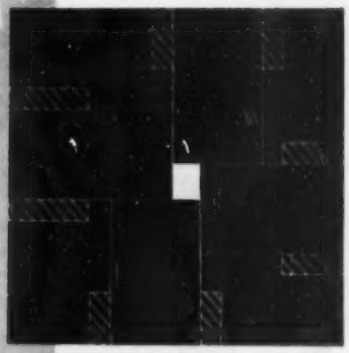
SOLID STEEL CONVEYOR PULLEYS

NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, CHICAGO THRIFT-ETCHING CORPORATION, 1555 SHEFFIELD AVENUE, CHICAGO 22, ILLINOIS



THE FENN TURKS HEAD offers many advantages over ordinary methods of shaping wire and rod. Featuring adjustable roll boxes, *it rolls* the material on both horizontal and vertical planes simultaneously. Available in friction drive or power drive.



UNIQUE FEATURE of Turks Head design is shown in this diagram of roll assembly. Four converging rolls form material to the desired shape. Square and rectangular shapes may be produced in varying dimensions by a simple roll adjustment.

Only Fenn Turks Heads bring you

MORE ACCURATE WIRE SHAPING AT LESS COST

A radical departure from the conventional draw-die, the Fenn Turks Head is characterized by the unusual operation and exceptional versatility of the die, in which the sides of the opening are four adjustable rolls. When the rod or wire is being formed into the more common square or rectangular shapes, the rolls may be adjusted to produce any width or thickness, in dimensions ranging from 0 to capacity.

EXCLUSIVE ADVANTAGES

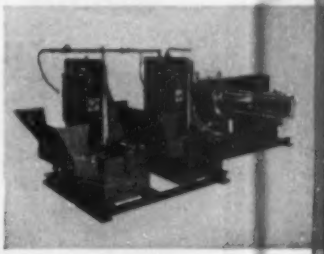
Increased Accuracy. When wire is shaped by ordinary rolling methods, the final rolling operation is apt to affect the dimensional accuracy secured by the edging process. By doing both these jobs at once — at the same point on the wire — Turks Heads eliminate this hazard. Also, since they roll *with* the work, Turks Head roll-surfaces are subjected to far less wear than rigid dies. This keeps wire sizes constant for a much longer period, to tolerances of ±.0005.

Greater Economy. Turks Heads eliminate the need for a costly inventory of stock as well as multiple dies, save the labor of frequent changing and redressing, and require less power than other methods.

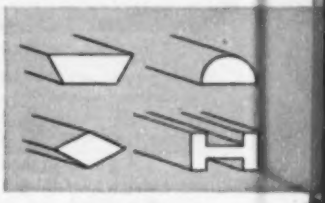
Faster. Besides their two-in-one operation, Turks Heads permit faster wire speeds.

GET THE DETAILS

on the many benefits Fenn Turks Heads can bring to your own wire-shaping operations. Contact your nearest Fenn Distributor, or write direct to THE FENN MANUFACTURING COMPANY, 1859 Broad St., Hartford 1, Conn.



FENN ROLLING MACHINES are built to take all sizes of Turks Heads, in double stand (as shown) or single stand.



ALL FROM THE SAME UNIT. Producing a wide variety of shapes from a single Turks Head is simply a matter of changing the specially ground rolls.

FENN MACHINES ARE SOLD BY:

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Forming metal for better and stronger products at lower cost

In the New Unit Rig Drawworks Drum Clutch

MEEHANITE® CASTINGS MEAN DEPENDABILITY - QUALITY

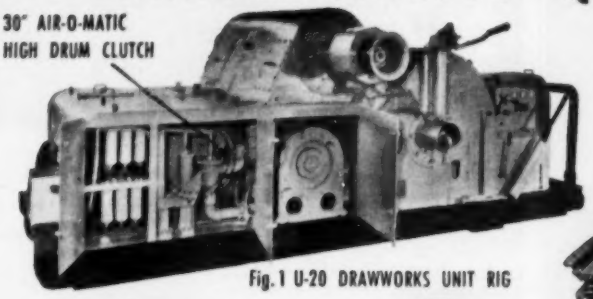

Fig. 1 U-20 DRAWWORKS UNIT RIG

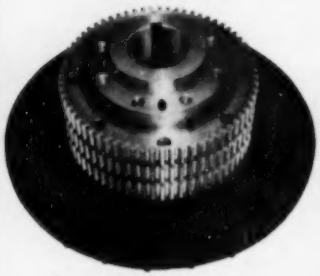

Fig. 2 HUB and BACK PLATE

Fig. 3 FLOATING PLATE

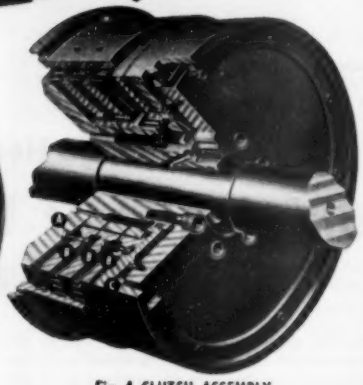

Fig. 4 CLUTCH ASSEMBLY

The proof that in important new designs and improved products such as the U-20 Unit Rig (Fig. 1), manufactured by Unit Rig Company, Tulsa, Oklahoma, Meehanite castings are regularly meeting rigid specifications is quickly provided by this example.

A feature of the U-20 Rig is a 30-inch Air-O-Matic clutch vital to its smooth dependable operation. In this clutch the following Meehanite castings are specified:

1. **Hub and back plates (Fig. 2)**
2. **Floating plates (Fig. 3)**
3. **Pressure plate (Fig. 4)**

To these components Meehanite castings contribute high strength, good anti-friction properties, machinability and uniform high quality.

For proof that Meehanite castings can improve your product write for the Meehanite Handbook.

Take *YOUR* Casting Problem To A MEEHANITE FOUNDRY

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The American Laundry Machinery Co.	Rochester, New York
Atlas Foundry Co.	Detroit, Michigan
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Builders Iron Foundry	Providence, Rhode Island
Compton Foundry	Compton, Calif.
Continental Gin Co.	Birmingham, Alabama
Crawford & Doherty Foundry Co.	Portland, Oregon
The Cooper-Bessemer Corp.	Mt. Vernon, Ohio and Grove City, Pa.
Empire Pattern & Foundry Co.	Tulsa, Oklahoma
Farrel-Birmingham Co., Inc.	Ansonia, Connecticut
Florence Pipe Foundry & Machine Co.	Florence, New Jersey
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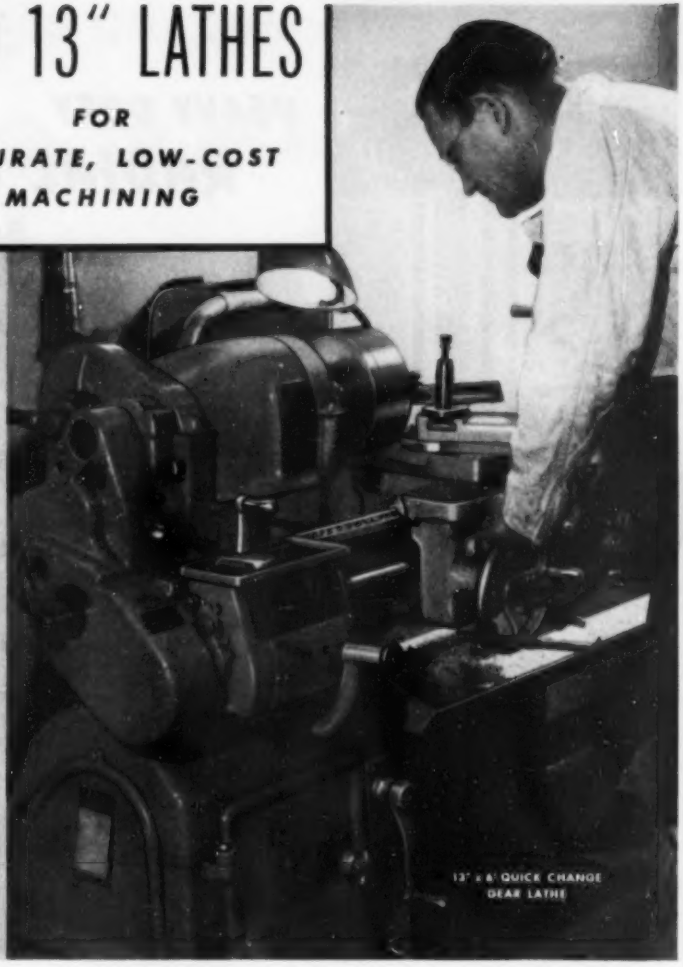
FOR ACCURATE, LOW-COST MACHINING



SPECIFICATIONS

SWINGS: 13-1/8" over bed and saddle wings; 8-3/4" over saddle with chip guard removed

BED LENGTHS: 4, 5, 6 and 7 feet

DISTANCE BETWEEN CENTERS: 16 to 52 inches

MAXIMUM COLLET CAPACITY: 1" (Collets interchangeable with South Bend 10"—1" Collet, 14-1/2", 16", and 16-24" South Bend Lathes)

SPINDLE BORE: . . . 1-3/8 inches

SPINDLE SPEEDS: Eight . . . 40 to 940 r. p. m.

POWER LONGITUDINAL FEEDS: 48 . . . 48 R. H. or L. H., .0015" to .0841"

POWER CROSS FEEDS: 48 . . . .0006" to .0312"

THREAD CUTTING: 48 R. H. or L. H. pitches . . . . . 4 to 224 per inch

CROSS SLIDE TRAVEL: 8-1/8 in.

TAILSTOCK SET-OVER: . . 15/16"

AIR NATIONAL GUARD · PROTECTS AMERICA ·

South Bend 13" Lathes are popular wherever there are a variety of precision parts to be machined. These quality-built lathes are fast and simple to operate. Set-ups and job change-overs are quickly and easily made. Maximum production at highest accuracy and lowest cost will reduce expenses in your shop. Write for complete information on South Bend Lathes and other machine tools. *Send Coupon now.*

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☐ 9" and 10" BENCH LATHES

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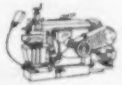

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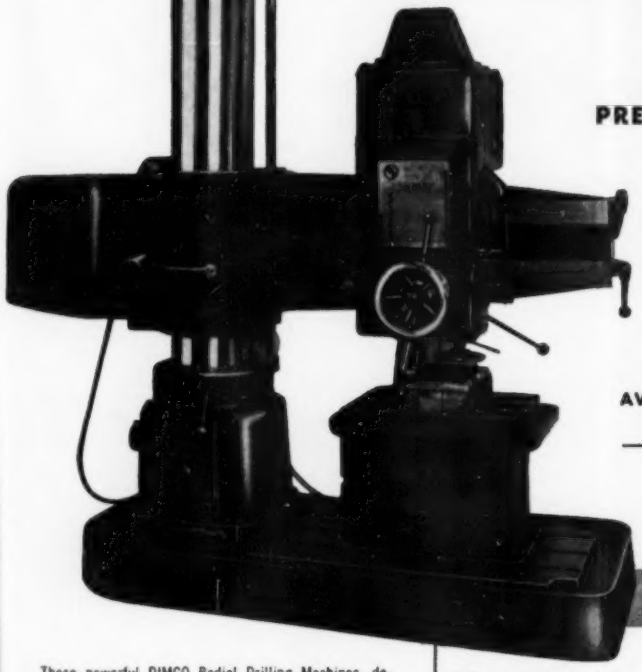
PRECISION BUILT FOR PRECISION PERFORMANCE



IMMEDIATE DELIVERY . . . NO PRIORITY REQUIRED

AVAILABLE IN TWO MODELS

No. TR-1	4 FT.
No. TR-2	5 FT.

These powerful DIMCO Radial Drilling Machines, designed and constructed for heavy production, are sturdy and rigid, giving production economy and top performance. Rigidity of the arm is the result of a system of wide ribs designed to avoid any variation, even when the saddle is in extreme outside position.

Spindle of the DIMCO is of high tensile special steel, ground all over. All gears, made from high tensile alloy steel, are hardened and ground on tooth profile with MAAG gear grinding machines. Gears and shafts are accurately balanced. They are cut with extreme precision from solid stock on Fellows machines.

The operator is always in full control of the DIMCO Radial Drilling Machine because of the built-in double friction-clutch. Column of the dual type, one internal and one external, of large diameter. Coolant system with electric pump and piping is built in. There is automatic lubrication of all saddle gears.

SPECIFICATIONS

	MODEL TR #1	MODEL TR #2
Drilling capacity in cast iron	2⅛"	2⅛"
Drilling capacity in steel	2"	2"
Tapping capacity in cast iron	2½"	2½"
Tapping capacity in steel	2"	2"
Boring capacity in cast iron	5⅛"	5⅛"
Boring capacity in steel	4⅛"	4⅛"
Maximum drilling radius	45⅜"	65⅜"
Minimum drilling radius	17"	18⅛"
Max. dist. from column to spindle axis	39⅜"	39"
Min. dist. from column to spindle axis	10⅝"	10⅛"
Max. dist. from spindle nose to baseplate	55⅞"	63¾"
Min. dist. from spindle nose to baseplate	8⅛"	10⅛"
Vertical range of arm on column	33½"	39⅜"
Vertical travel of spindle	13¾"	13¾"
Outside diameter of column	12⅜"	15"
Min. and Max. diameters of spindle	1.417"—1.653"	1.417"—1.653"
Morse taper	#5	#5
Overall dimensions of baseplate	76⅛" x 36⅛"	100" x 42"
Working surface of baseplate	47¼" x 35¼"	67" x 41⅜"
Working surface of table	19⅛" x 23⅛"	29½" x 29½"
Overall height of machine	89⅛"	122"
Spindle speeds	12	12
Range of spindle speeds in RPM	48—1200	48—1200
Number of feeds	6	6
Range of feeds per spindle rev.	.0033"—0.02"	.0033"—0.02"
Power required	5 H.P.	5 H.P.
Approximate net weight	7260 lbs.	9680 lbs.
Approximate gross weight crated	8300 lbs.	10,900 lbs.

Write us for complete information!

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IMPORTERS OF MACHINE TOOLS

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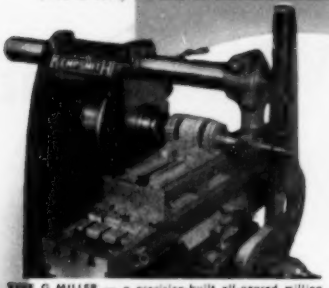
Ruggedness and Power Speed Up Machining Operations

The dependable Kempsmith line of machine tools includes the well-known Kempsmith Type G Milling Machines... the new, streamlined Type LH Miller and Kempsmith-Defiance Horizontal Boring, Milling and Drilling Machines. Also a complete line of Standard Attachments, Arbors and Accessories.



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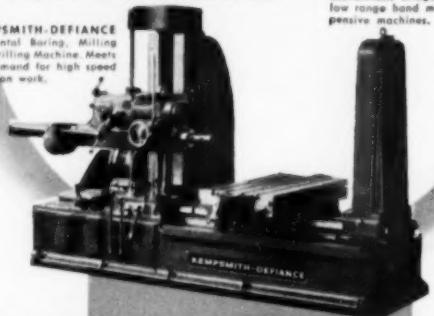

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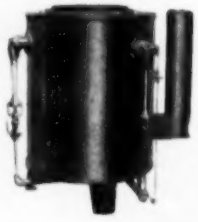

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You get longer tool life, more production... and reduced maintenance.

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P. O. Box 1138 Trenton 6, N. J.

Manufacturers of Permanent Magnet and Electromagnetic Separators

SQUARE D COMPANY'S 600% Production Gain shows what happens when metal removal is handled on the RIGHT machines

Up until the time the Square D Company, control manufacturer of Milwaukee, turned to Oilgear Fluid Power Broaching for the preparation of soft iron armature and magnet frame parts for motor control, the company had been milling, grinding and deburring these parts, and its best rate was 75 pieces per hour.

What happened when Square D turned to Oilgear Fluid Power Broaching

The first thing that happened when the Square D Company turned to Oilgear Fluid Power Broaching was that on a *one pass* operation, it got a finer finish at closer tolerances on the completed part. The second thing was that instead of three separate operations, it had only one operation. The third thing was that it got 350 pieces per hour at once. The fourth thing was that with a minor fixture redesign production soared above 525 pieces per hour.

Can you expect such production increases if you change to the right machines?

If the best Oilgear Fluid Power Broaching offered you was a gain of a few pieces per hour, doubt about the advantages of Oilgear might be reasonable. Even if a 600% increase was only an isolated instance, hesitation might still be justified. But when . . . *AS A RULE* . . . Oilgear Broaching immediately results in a disproportionately large production increase, with better finish and closer tolerances then there can be only one conclusion.

If in any of your operations you remove metal from a part which can be broached, or even material from hard rubber stock for example . . . and if you are not handling the work by broaching, then it is high time you really get to the bottom of Oilgear Fluid Power Broaching. Really *investigate* it. You may be due for one of the pleasantest and most profitable surprises of your business career.

THE OILGEAR COMPANY
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OILGEAR *Fluid Power Broaching*

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Parts broached: Laminated armature and magnet frame assemblies used in Square D magnetic starters. Material is soft iron which tears and burrs easily. Previous handling: milling, grinding and deburring. Best production, 75 pieces per hour.

Oilgear Broaching produces far better finish, requires no deburring, requires one operation instead of three. Ten different sizes and shapes of assemblies are accommodated on two sets of fixtures. Production is better than 600 pieces per hour.

Broaching operation is continuous and automatic with minimum fatigue to operator who sits or stands at work. Operator merely unclamps and removes broached part, loads and clamps rough part.

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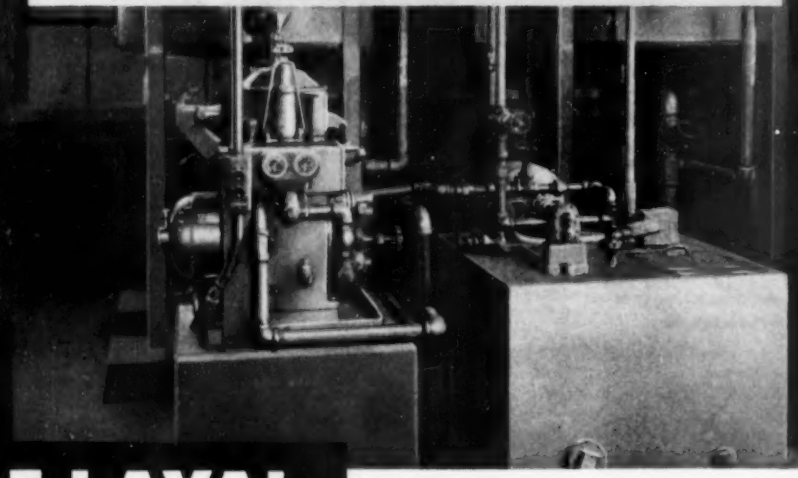

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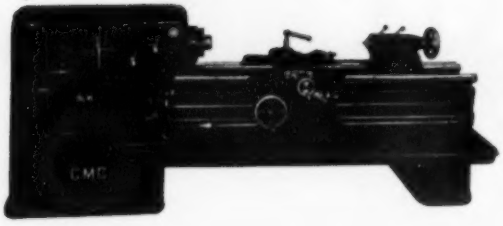
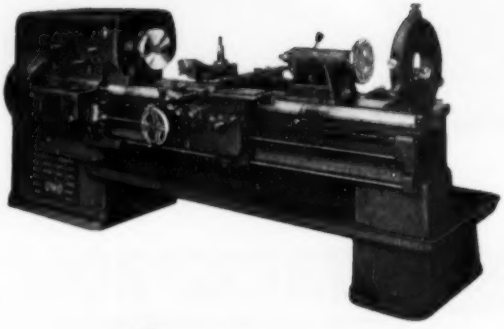


PRECISION
TOOL ROOM LATHES
16" & 18" Swing

16 spindle speeds — Anti-friction bearings thruout—66 feed changes in the quick change gear box—motor in leg.



HEAVY DUTY
"MASTER" LATHES
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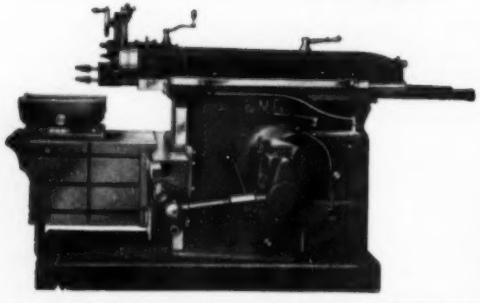
16 spindle speeds — Anti-friction bearings thruout — 66 feed changes in the quick change gear box—motor in leg.



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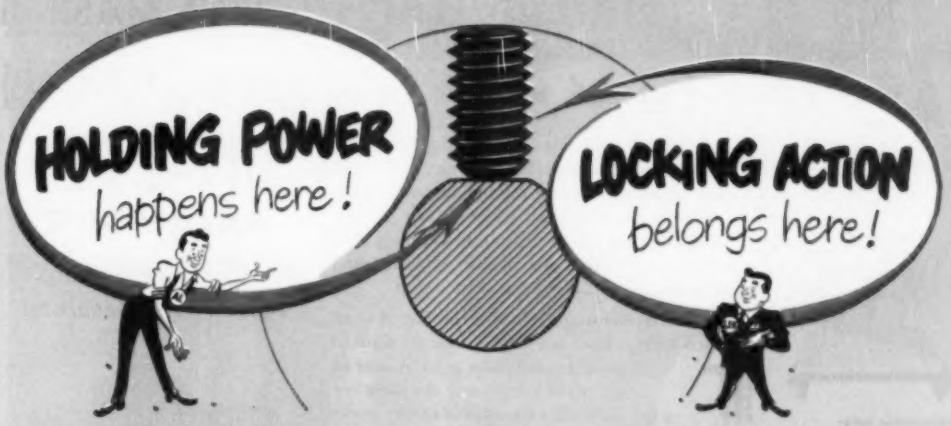
WHEN YOU SPECIFY SET SCREWS, REMEMBER . .



To do its job a set screw must *hold firmly* against both rotation and sideway motion, and it depends entirely on the *point* for this holding action.

Allen ○ screws hold better because they have the strength to permit firmer tightening, and because the points are designed *only* to produce maximum holding power.

Allen design does not compromise the holding power of the point in an attempt to make it perform a locking function too. Allen ○ screws require no locking action at the point, because of their high uniform accuracy of fit, pitch diameter and perfect thread lead. This provides maximum thread contact with ample friction to lock the screw in position during use and *re-use* under extreme vibrating stress.

THE **BUY** WORD IN SOCKET SCREWS IS **ALLEN**

WARNING
Allen-Type screws aren't necessarily Allen-Made.
Get genuine "Pressur-formed" Allen ○ Head screws in this black and silver box.

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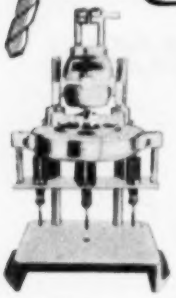
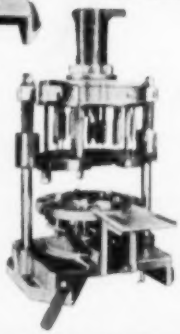


Adjustable spindle heads and fixtures.



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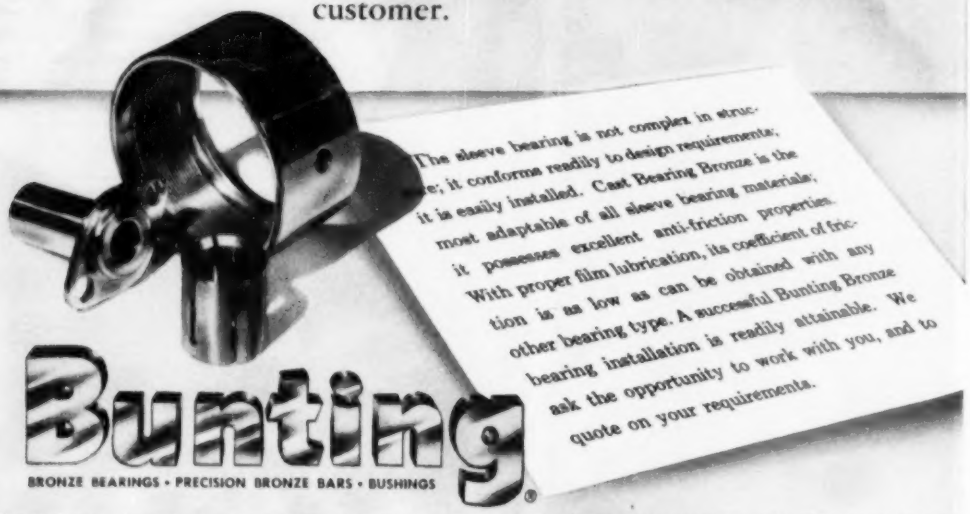
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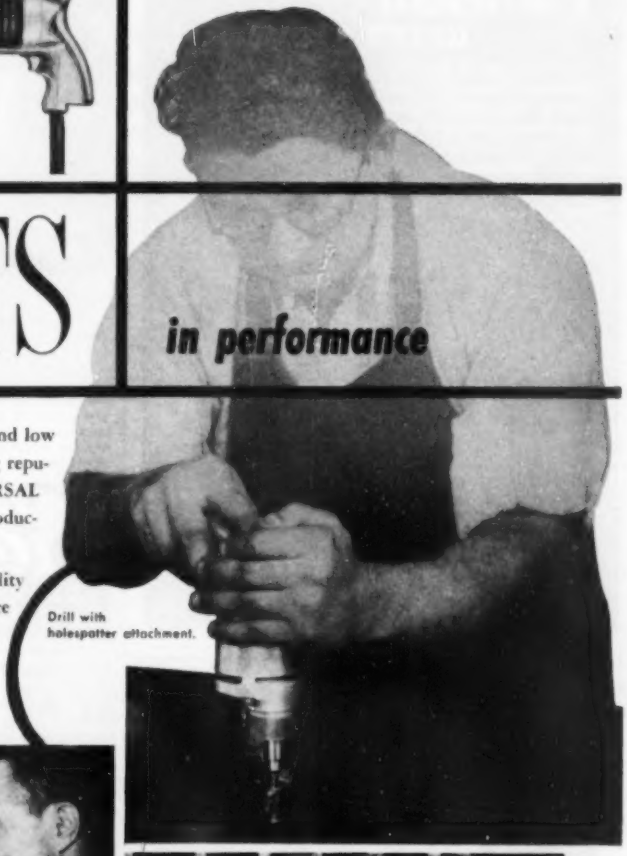

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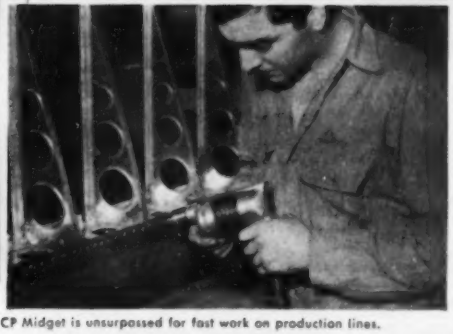

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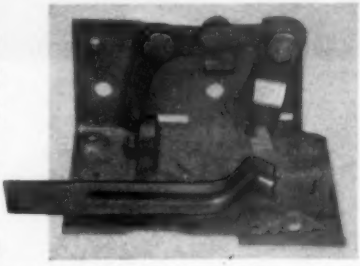

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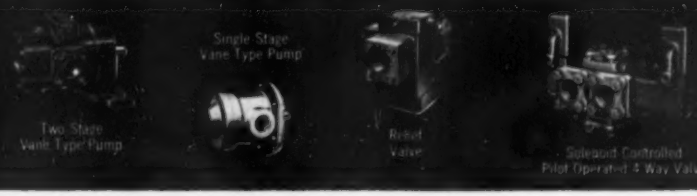

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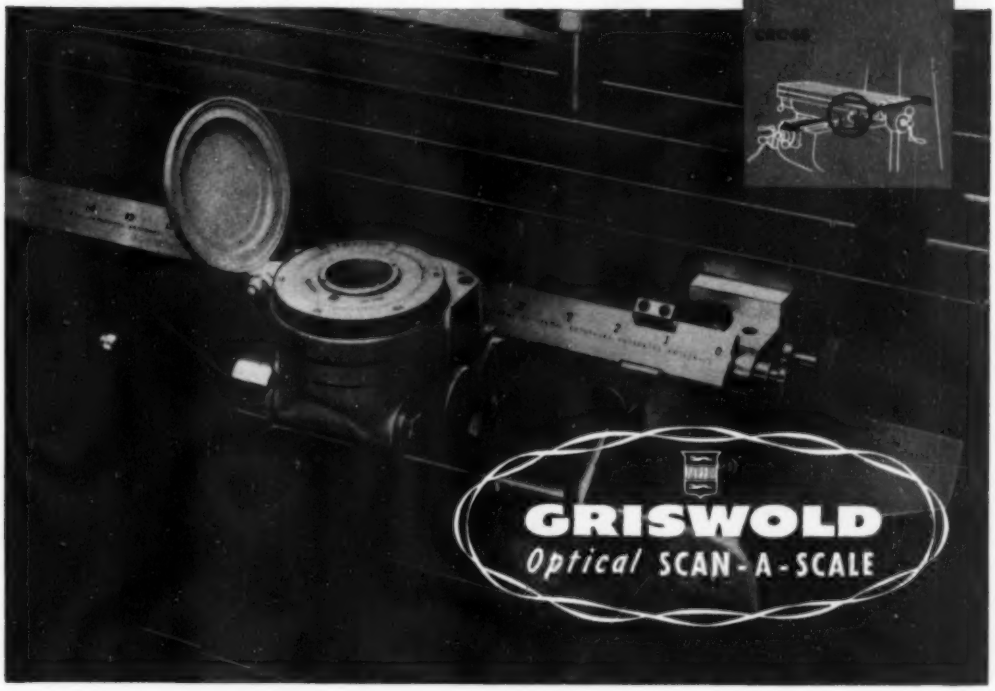

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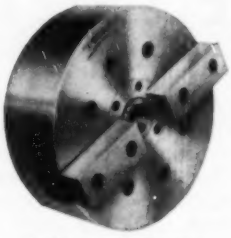
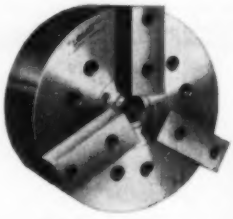


Two-jaw, combination type



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Wittek Roll Feeds handle any type of coiled strip stock and are made in single roll, double roll, and compound types with straighteners, in models to feed in any of four directions. They are reliable and accurate with simple, quick adjustment of feed length. Standard sizes and models meet a wide variety of press size and capacity conditions.

Wittek Reel Stands facilitate handling coiled stock.

* Write for full particulars

WITTEK Manufacturing Co.

4320 W. 24th Place, Chicago 23, Illinois

Automatic ROLL FEEDS AND REEL STANDS

Over 85% of the torque wrenches used in industry are

STURTEVANT TORQUE WRENCHES

Read by Sight, Sound or Feel.

- Permanently Accurate
- Practically Indestructible
- Faster—Easier to use
- Automatic Release
- All Capacities

in inch ounces . . . inch pounds . . . foot pounds (All Sizes from 0-6000 ft. lbs.)

Every manufacturer, design and production man should have this valuable data. Sent upon request.

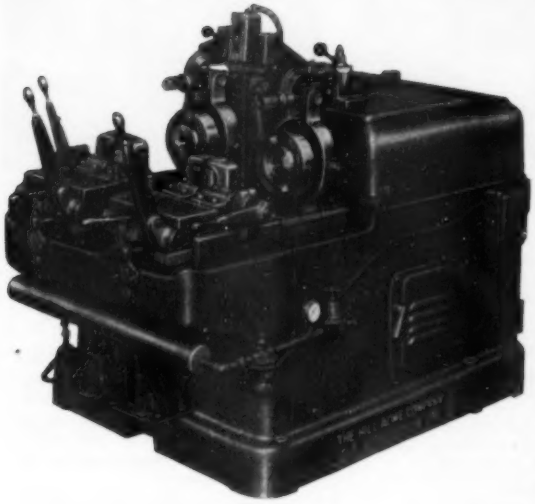
A STURTEVANT CO.

Another FIRST

FOR

ACME XL

THREADING MACHINES



Air operated Head now available . . .

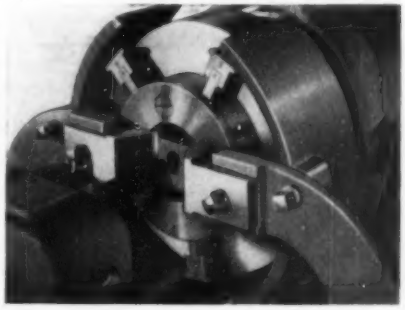
Acme Model XL Threading Machines can be equipped with a semi-automatic, air-operated head-opening and closing mechanism for rapid lock and release of dies to provide greater accuracy of thread length and reduce operator fatigue. A bleeder valve adjustment provides variable speed to this head tripping mechanism. Forward and return movement of the carriage effects the opening and closing of the die head.

This new device is an exclusive feature of ACME Model XL Threading Machines and is adaptable to both single and double spindle machines in the complete range of sizes offered.

HILL ACME TOOLS FOR INDUSTRY

ACME HOB TYPE 5 DIE HEAD

The problem of threading rectangular stock with an interrupted cut, is solved by the ACME HOB TYPE 5 die head. This special head insures three chasers always being in contact with the work. With the five die head illustrated, a guide is provided to compensate for the torque developed when threading rectangular stock. This adaptation of ACME Threading Equipment to difficult jobs, illustrates why the large percentage of pipe wrench manufacturers are using ACME Threading Machines today, replacing the obsolete thread milling method.



THE HILL ACME COMPANY

ACME MACHINERY DIVISION • 1207 W. 65th St., Cleveland 2, Ohio

ESTABLISHED 1862

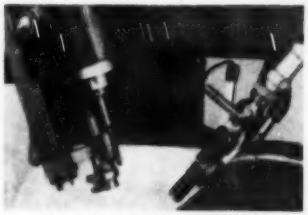
"ACME" FORGING • THREADING • TAPPING MACHINES • ALSO MANUFACTURERS OF "HILL" GRINDING AND POLISHING MACHINES HYDRAULIC SURFACE GRINDERS • "CANTON" ALLIGATOR SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES

At Last! A Way To Get Uniform Rake Angles On All Taps

The difficulty of regrinding a once-accurate tap to its original rake angle is often responsible for low production per tap and excessively high tap costs. Grinding other taps to the same uniform rake angle has also presented a problem.

A METHOD OF PRECISION SHARPENING

There is, however, one method of sharpening both old and new taps precisely to provide one uniform rake angle—the one which is desired. These excellent sharpening results can be obtained by regularly using the Blake Flute Grinder and the Blake Chamfer Grinder for all your taps. These are the only two machines on the market today that enable you to grind your taps to such true-cutting accuracy. With Blake equipment you can sharpen each tap precisely to provide not only for uniform rake angles on each cutting edge, but also for uniform spacing of cutting edges and accurate chamfers. The Blake method of precision sharpening results in much longer tap life, greatly reduced tap costs, and more accurate finished work.



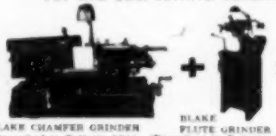
THE HEART OF PRECISION SHARPENING! Photograph shows close-up of tap positioning mechanism of the Blake Flute Grinder.

READ THE FACTS NOW!

For a detailed explanation of the benefits of precision tap sharpening, write us for the recent *Machinery* article, "Why Taps Should Be Sharpened Precisely". It may prove an eye-opener! Descriptive bulletins on both Blake machines are also available at your request.

IT'S A FACT! YOU CAN REDUCE YOUR TAP COSTS 50 to 75% by installing Blake tap sharpening equipment and sharpening your taps as you do other metal cutting tools.

PUT THIS COST-CUTTING COMBINATION TO WORK FOR YOU NOW!



BLAKE CHAMFER GRINDER (Described in Bulletin 551) + BLAKE FLUTE GRINDER (Described in Bulletin 651) =

ACCURATE, TRUE-CUTTING TAPS
LESS TAP BREAKAGE
600% MORE PRODUCTION PER TAP
UP TO 75% REDUCTION IN TAP COSTS

Write for details about both machines!

EDWARD **BLAKE** COMPANY 435 CHERRY ST., WEST NEWTON 65 MASSACHUSETTS

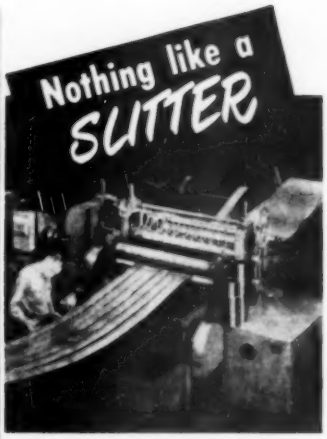
BLACK DIAMOND PRECISION DRILL GRINDERS . . .
WALTHAM CUTTER SHARPENERS . . . SURFACE FINISH STANDARDS

From the *American Machinist* Library of *Tips for Top Shop Men*

DON'T flaunt your greater income or privileges before your subordinates. No matter how much they like you, their resentment and envy will do you more harm than the flaunting does your ego good.

REMEMBER that human problems need careful study just as do engineering problems. Man is multi-motivated and one prescription won't cure all his ills.

BE suspicious of any figures you hear, and of most of those you see. If they don't correspond immediately to your previous experience, check 'em before you quote or use 'em. The urge to make numbers bigger, or smaller than anything previously reported is overpowering to some people; don't be victimized.



for Speeding PRODUCTION SCHEDULES

If you have a Yoder slitter you can buy mill-width coils instead of slit strands. Sources of supply of mill-width coils are more numerous, so you can buy wherever you like, at substantially lower prices, and obtain quicker deliveries.

Inventory requirements, too, are greatly reduced, because you can, in a few hours, meet expected and unexpected demands for slit strands from a relatively small stock of mill-width coils of the proper gauges.

This means better control, not only of coiled strip supply, but of production planning. You will find production schedules much easier to meet.

For requirements as low as 100 tons per month, direct savings alone may be sufficient to repay your investment in a Yoder slitter in the short time of one year.

For information on the respective merits of different types and sizes of slitters and accessories, as well as on the economics of slitter operation, time studies and other data, send for new Yoder illustrated Slitter Book.

THE YODER COMPANY
5519 Walworth Avenue • Cleveland 2, Ohio

Rotary Gang SLITTERS

ENGINEERING YODER MANUFACTURING

SCHAERER

HIGH DUTY LATHES for PROMPT DELIVERY

Built to the Highest American Standards of Accuracy, Productivity and Convenience

With the attachments available, these German-designed and built lathes represent the **maximum** in versatility . . . production lathes built to tool room standards, recognized universally for high precision and top performance.

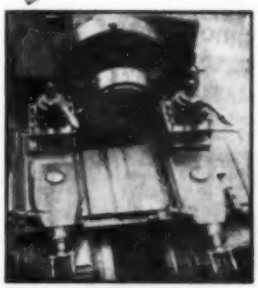
Specifically, the SCHAERER HIGH DUTY LATHE offers:

- . . . all gears in headstock hardened and ground.
- . . . front and rear main spindle bearings lubricated by separate oiling system.
- . . . main shaft motor-driven through forward and reverse multidisc clutches.
- . . . multiple-screw cutting attachment provided on headstock.
- . . . quick-change gear and carriage equipped with one-shot oiling system.
- . . . carriage automatically released by friction cutch in case of overload.
- . . . cross slide equipped with ball catch stop for accurate adjustment of depth cutting.
- . . . adjustable carriage stop provided for longitudinal turning.

Full detailed specifications are contained in illustrated brochure available promptly on request.

Come and see these lathes in operation under power. Bring samples for test purposes if you wish.

Variety of tooling combinations available.



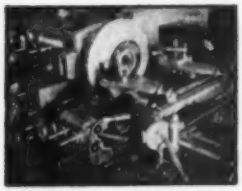
Twin cross slides for two simultaneous cuts.

Condensed Specifications

18" to 20" swing available.

20" to 22" swing over gap.

Distance between centers from 20" to 120".



Hydraulic Copying Attachment with twin cross slides for facing work and turning between centers.

M. B. I. EXPORT & IMPORT LTD.

475 GRAND CONCOURSE — MBI — BRONX 51, NEW YORK

L'IL CHAMP
ALRIGHT, JOE, LET'S FACE IT! WE'RE BACK IN IT AGAIN AN' EVERY MINUTE COUNTS! WHAT CAN WE DO TO START THE BALL ROLLING—PRODUCTION CONTROL SAYS WE HAVE ALL THE MEN AN' MATERIALS FOR TOP OUTPUT, YET WE'RE BEHIND SCHEDULE. WHAT GIVES!!!
OFFICE
IT'S FINAL ASSEMBLY IN THE WELDING DEPARTMENT- WE CAN'T GET ALL THE WORK OUT AN' MAKE REPAIRS ON REJECTS AT THE SAME TIME!
BOYS, THOSE CHAMPION GRAY DEVIL No.2 ELECTRODES DID THE TRICK! PRODUCTION IN OTHER DEPARTMENTS MUST INCREASE JUST TO KEEP THE WELDING DEPARTMENT ROLLING!
WELDING IS NO LONGER OUR BOTTLENECK- NOT SINCE WE PUT CHAMPION GRAY DEVIL No. 2 ELECTRODES TO WORK FOR US!
CHAMPION
WHEN SMOOTH BEADS, LOW SPATTER AN' GOOD PRODUCTION RATES ARE NECESSARY THAT'S WHEN YOU NEED CHAMPION GRAY DEVIL No.2 ELECTRODES! EXCELLENT ARC-STRIKING CHARACTERISTICS AND ITS ABILITY TO OPERATE ON HIGH WELDING CURRENTS MEANS FASTER WELDING AT LOWER OPERATING COSTS. WHEN WELDING—USE THE BEST—USE CHAMPION GRAY DEVIL No.2!!
THE CHAMPION RIVET CO
CLEVELAND, OHIO
East Chicago, Ind.

L-W

SWIVEL BASE MILLING MACHINE VISES

STRONG — ACCURATE

. . . yet REALLY LOW PRICED!

Ideal for drill press and shaper

High-grade semi-steel castings. Hardened steel sliding jaws with full length bearing on a ground bar and machined ways.

The 4½" and 6½" sizes have a large Acme steel screw with replaceable bronze nut. Four bolt and key slots for rigidity attaching to table so work-holding surfaces are at right angles or parallel to table.

HUSKY $21.85

Jaws 3" wide, 1" deep. Opens 2" with jaws. Wt. 16 lbs.

JUNIOR $36.55

Jaws 4½" wide, 1½" deep. Opens 3" with jaws, 3½" without. Wt. 40 lb.

MASTER $54.56

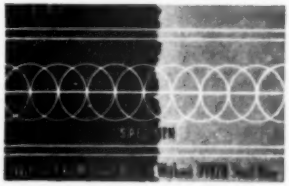
Jaws 6½" wide, 2" deep. Opens 4" with jaws, 5½" without. Wt. 85 lb.

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY 25 SO. ST. CLAIR ST. TOLEDO 4, OHIO

DYKEM STEEL BLUE

STOPS LOSSES making dies & templates



Simply brush on right at the bench: ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2301 B North 11 St., St. Louis, Mo.

HOLMAN BETTER, FASTER HOLE FINISHING

HELICAL TAPER PIN REAMERS

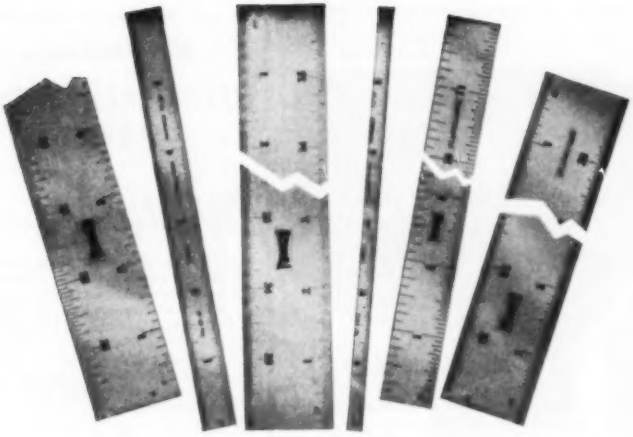
Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.

Precision power presses and feeds in a wide range of types and sizes to meet every requirement.

See Pages 60-61 March 3rd, American Machinist

THE V & O PRESS CO. *Division of Emhart Mfg. Co.* HUDSON, N. Y.



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Steel Rules

Accurately ground and graduated with dark, contrasting, easily read lines and numbers. Made from spring tempered steel, rigid, semi-flexible and full flexible. Many combinations of English, Metric or English-Metric graduations. Special rules and scales made to specifications. Write for free catalog.

TUBULAR MICROMETER CO.
ST. JAMES, MINNESOTA

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FOR EVERY JOB

TUMICO

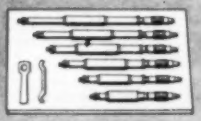
PRECISION MEASURING INSTRUMENTS

TUMICO BAR MICROMETERS
Provide a wide range of precision measurement with low investment. 30 models from 6" to 168".

TUMICO DIAL INDICATOR GAGES
Quick vision Tumico micrometers and gages to meet your special measurement requirements.

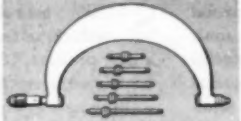
TUMICO MICROMETER SETS
Complete sets for a broad range of accurate measurement operations. From 0" to 30" in 1" steps.

TUMICO VERNIER CALIPERS
Precision made. Accurate, clearly etched graduations and numerals. 24 models from 6" to 48".



TUMICO INSIDE MICROMETERS
Tubular construction; insulated from hand heat for full precision. 37 models from 1" to 106".

TUMICO POST GAGES
Precision micrometer or dial indicator instruments adaptable to a wide variety of uses. 10 models.



TUMICO OVER-THE-BAR MICROMETERS
Precision bore measurement without removing boring bar. 11 models from 3" to 28".

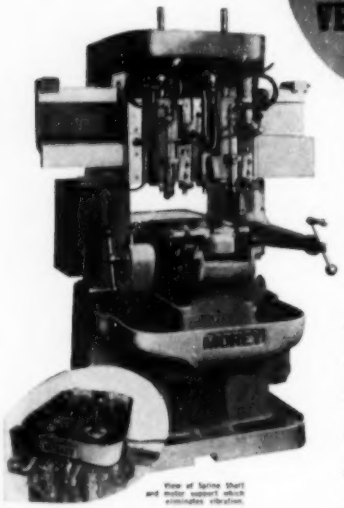
TUMICO COMBINATION SETS
Square, Gage, Center Finder, Protractor, Scriber, Level, Rule, Straight Edge. Handy and useful.

FOR RAPID, ECONOMICAL DUPLICATION OF SMALL PARTS *that require accurate interchangeability ...with minimum effort!*

INVESTIGATE

Morey

VERTICAL PROFILER and MILLING MACHINE



View of Spline Shaft and motor support which eliminates vibration.

More than 40 years of experience in designing, developing and building fine machine tools are incorporated in this dependable, time saving Profiler and Miller.

Over 2000 of these efficient machines are giving top results throughout the world . . . accurately duplicating aircraft and gun parts, etc., from a flat master.

CHECK THE MOREY PROFILER'S IMPORTANT FEATURES:

- *Balanced Cross-Slide*
- *Rigid and Vibration-free*
- *Anti-friction bearings throughout*
- *Spline shaft spindles*
- *Hardened steel ways on Cross-Slide*
- *One-shot lubrication*
- *Built-in coolant system*
- *V-Belt spindle drives*
- ● *6 WEEK DELIVERY!*

PARTIAL LISTING OF SPECIFICATIONS:

Working surface of Table	10"x10"
Travel of table, longitudinal	25"
(with stops)	17½"
Distance between spindles, center to center	12"
Spindle speeds (6)	2700 1880 1290 890 620 425
Cross rail traverse movement	32"
Motor Drive	½

Write us today for fully illustrated and diagrammed circular that supplies complete information!

MOREY ...for more value!

MOREY MACHINERY CO., INC.
Manufacturers • Merchants • Distributors
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Whether you need an instruction book or service manual to accompany your equipment written to government specifications . . . or product catalogs . . . or training booklets . . . or industrial literature . . . our writing staff can do the job for you. It will do the research, planning, writing, and organizing to satisfy your requirements.

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The editors of our staff are thoroughly familiar with government publication specifications. In addition to being technical editors, they are also experienced in rewriting and organizing rough manuscript, or in revising published material. Many have taught or have been trained in teaching and are, therefore, able to recommend or inject proper pedagogical presentation of material.

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Our printing, binding, and paper resources are among the best in the country. Every type of reproduction is available . . . offset, letterpress, multigraph, or even mimeograph. We can handle a complete printing job or, in the case of offset, furnish repro copy when other facilities must be used.

Save money and time . . . let our staff be your staff for technical publications. Write for our brochure or ask our representative to call.

Technical Writing Service

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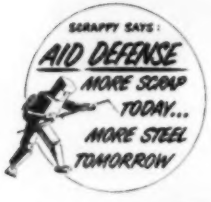
From the *American Machinist* Library of *Tips for Top Shop Men*

SPECIAL jobs take special doing. They're the most profitable places to try special tools, special coolants, special operators. Too often the tendency is to be content with any method that will do the job at all.

STUDY merchandising's technique for introducing a new product. It'll pay you to try the same methods when installing new equipment. You'll avoid resistance not only from workers but also from foremen.

Grandpa Never Threw a Thing Away



It's only human to want to hold on to things after they've outlived their usefulness. That's why today millions of tons of worn-out and obsolete equipment and machinery are lying forgotten in the country's plants and factories and on farms.

The steel industry needs these millions of tons of dormant scrap, needs it in the worst way. With this vital dormant scrap the entire steel supply picture would brighten up, with more steel for everybody. But without it, the steel industry cannot hope to keep up production at present levels.

Call in a scrap dealer now, today. He will buy your dormant scrap and start it moving toward the steel mills.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

More Scrap Today... More Steel Tomorrow

In the Steaming Jungles of the GRAN CHACO

Indians Use Marking Devices!

Deep in their South American jungle homes the Chaco Indians use tattooing extensively. The marking indicates rank, family, clan and achievement. These tattoo marking devices are extremely important to both Chaco braves and women. The higher their rank, the larger number and variety of tattooing designs.

CADILLAC MARKING DEVICES

are Designed for ALL MARKING PURPOSES

Whatever your requirements, from small Hand Stamps to Pneumatic, Hydraulic or especially created Marking Machinery, CADILLAC STAMP COMPANY stands ready to supply or design and build to meet your needs.

AUTOMARK AUTOMATIC MARKING MACHINE

Here is an ideal air-operated marking machine, especially adapted for light, flat marking. Great time savings in production marking are effected by this Automark because the machine has been tooled to mark as many as 15,000 parts per hour. (The machine illustrated shows a dial feed fixture adaptation for marking brass nuts at a rate of 3,000 per hour.) Also, the Automark can be readily adapted for high speed color marking by the branding method. No special jigs or fixtures are needed for average work. The automatic controls think for the operator, give high production. The machine is well guarded for complete safety to hands new to industry. It is light in weight and can be easily moved to any place where its installation is desired.

ROLL SEGMENT DIES
Engraved on alloy tool steel, these dies excel for marking various types of circular work with trademarks, sizes, etc. Rapid changing of individual dies to fit the particular job is one of the features for this flexible system of marking.

FORGING HAND STAMPS
These CADILLAC Stamps, made of special alloy tool steel, insure long life and unexcelled performance. Stamps can be engraved to fit the contour of parts to be marked. Any design, trademark, lettering or numbering can be engraved in any size to fit your marking requirements.

DIE INSERTS
On many metal stampings, marking operations can be completely eliminated by inserting CADILLAC Die Inserts into the dies.

CADILLAC STAMP CO.
17311 RYAN ROAD • DETROIT 12, MICH
3800 IRVING PARK • CHICAGO 18, ILLINOIS

LOW COST PROTECTION FOR MAN AND MACHINE

ELASTICONE® GUIDE PIN COVERS

JUST SNAP INTO PLACE

NO TOOLS REQUIRED

NO INSTALLATION COSTS

Elasticones are manufactured in stock sizes. Specify O.D. of bushing and full open height of set when ordering.

Protects Pins and Bushings from nicks, scratches . . . prevents injuries to Die Setters & Operators. Write for full information.

CENTRAL SAFETY EQUIPMENT COMPANY

2200 E. HUNTINGDON STREET, PHILADELPHIA 25, PA.

FREE TRIAL OFFER NO STRINGS ATTACHED

A VALUABLE KIT
Carton contains 6 grades of abrasive quality, assorted fine grit abrasive compounds suitable for a variety of work. Coarser grit compounds can also be supplied.

FOR PRECISION LAPPING

Here's a get-acquainted offer you cannot afford to miss. Among these samples will be found the answer to many a tool room lapping problem. Hard and soft abrasives for all kinds of lapping needs. Sent post paid anywhere in the U.S.A. and Canada.

No obligation—write today on your company letterhead.

OFFER LIMITED to those writing on company letterhead

PROVE THEM AT OUR EXPENSE!

UNITED STATES PRODUCTS CO.
518 HELWOOD ST. PITTSBURGH, PA.

FIND TOOL STEELS HARD TO GET?

STRETCH WHAT YOU HAVE WITH

DISSTON

"FIGHT WASTE" PROGRAM

In spite of the best efforts of the steel industry . . . in spite of above-capacity steel production — tool steels remain in short supply and are getting more so every day!

The Disston "Fight Waste" Program can help you stretch the supply of tool steels you now have . . . can help you do more with the steels you are now using. Basis of the "Fight Waste" Program is the use of individual instruction cards on six basic types of tool steels. These cards contain information on the selection, working, and application of tool steels to help you get better tool performance and longer tool life—to help cut waste of vital steels.

DISSTON SUPPLIES THESE CARDS FREE — WITHOUT COST OR OBLIGATION — IN QUANTITIES DESIRED. ORDER BY NUMBER

No. S-1 HIGH SPEED STEEL, TUNGSTEN-MOLYBDENUM TYPE
(Comparable to DISSTON 6-N-6)

No. S-2 WATER-HARDENING CARBON OR CARBON-VANADIUM TOOL STEEL
(Comparable to DISSTON Best Tool or Vatool Steel)

No. S-3 AIR-HARDENING HIGH-CARBON HIGH-CHROMIUM STEEL
(Comparable to DISSTON Croloy)

No. S-4 OIL-HARDENING TOOL STEEL
(Comparable to DISSTON Mansil)

No. S-5 CHROME-TUNGSTEN CHISEL STEEL
(Comparable to DISSTON Keystone)

No. S-6 NICKEL-CHROME, OIL-HARDENING TOOL STEEL
(Comparable to DISSTON Nicroman No. 827)

Disston also has "Fight Waste" instruction cards covering a wide variety of wood and metal cutting *tools*. These cards provide specific information on the most efficient use and care of tools to reduce breakage, stop waste of material, and increase production. We'll be glad to send you complete information. Use the coupon below.

NEEDED:

HALF A TON OF SCRAP FOR EVERY TON OF STEEL

An opportunity for every plant to help "Fight Waste": Record-breaking steel production and continued large-scale expansion of productive capacity have forced the scrap inventories of American steel mills to dangerously low levels. It is absolutely vital to the continued production of steel—*to your supply of steel*—to increase the flow of scrap to steel mills.

FREE FOLDER—sent on request! A special Disston folder on steel scrap: tells what types of scrap are needed . . . how to organize your plant for scrap salvage . . . where to sell your scrap. Disston will supply you with as many of these folders as you need...FREE!

SCRAP TURNED IN . . . IS STEEL TURNED OUT!

HENRY DISSTON & SONS, INC.
420 Tacony, Philadelphia 35, Pa., U.S.A.

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Please send me the following: (Check)

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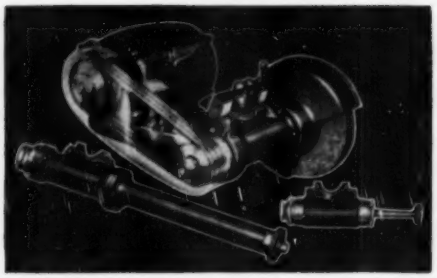


YOUR LATHE is a precision Grinder!

Either internal or external—your boring mill, too—and planer and other machine tools in your shop, are now capable of precision grinding of rolls, surface plates, bearings, journals, mandrels, cutters, etc. They merely require a HISEY Wide Range Precision Grinder attached to their regular tool holding fixture.

Built in a number of sizes and types, they are adaptable for production work as well as the thousand and one odd grinding jobs which crop up in every shop and tool room.

The V-Belt drive affords the most efficient and economical speed and permits rapid speed changes as required.

Driven by constant speed motor, a steady, uniform speed is maintained as required for best results.

Catalog 71 XA on Request

Hisey THE HISEY-WOLF MACHINE CO.
CINCINNATI 8, OHIO

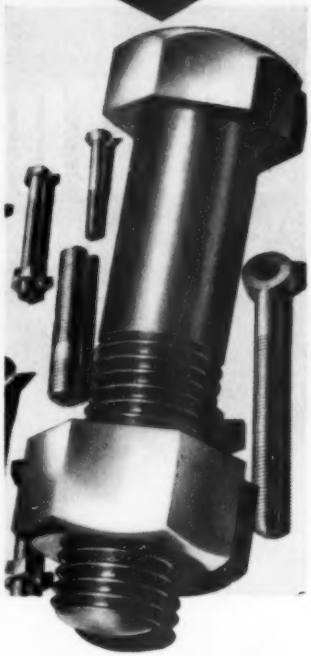
From the *American Machinist* Library of *Tips for Top Shop Men*

YOUR manufacturing engineers should have just one job: to make your present methods obsolete. The more they succeed, the greater is your productivity.

AN invisible boss presides over every collective bargaining session. He is not labor, management, or government—but is the customer, who exercises power of selection over your company's products.

TWO of management's most important words are "know" and "no." If you're strong on the first, you seldom hear the second.

First for
BOLTS
NUTS
STUDS



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THE PLACE TO SOLVE YOUR BOLT PROBLEMS

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HOW AIRFEEDRILL* BROKE A PRODUCTION BOTTLENECK

In producing this small part, a drilling operation kept one worker busy full time. Her output set the pace for the entire production line . . . placed a top limit on output per hour and per day.

The job didn't warrant an extra drill press and operator, so the ingenious shop foreman set up a simple mounting and fixture with a Keller Airfeedrill.*

Now by pressing a valve, holes are drilled as fast as the operator can load and unload the fixture. Castings pass this operation so fast that the worker has time to do other jobs, too. Production of the whole line has increased, and costs have gone down accordingly.

The Airfeedrill can help you speed output of short run or production drilling jobs. A Keller sales engineer will gladly discuss it with you.

- Assures accurate holes without costly fixtures . . . can be used with existing jigs
- Attaches in any position and supports itself at any angle
- Operates and is controlled entirely by air . . . with pneumatic cycling to speed production, reduce operator fatigue
- Small size permits it to be used on close centers and in tight places
- Accurately drills parts too large for conventional drilling machinery
- Wide range of speeds and strokes will accommodate light or heavy metal, wood, composition, plastic
- Lightweight portable and stationary models are readily adapted to changing job requirements . . . quickly shifted from job to job

* Keller Tool Company Trade Mark

KELLER TOOL COMPANY
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KELLER *Pneumatic Tools*

Are you equipped TO HOLD YOUR JOB— TO GET A NEW ONE?

IT WORKS in the metal working field as well as in any other. Some men fit themselves to do a little more than their job calls for. They fit themselves to do a little more than the other fellow. They make a steady effort to equip themselves with the best kind of a job insurance there is—KNOWLEDGE.

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Gives the essential principles involved in turning and boring operations . . . a picture of the kinds of machines in use and methods of operating them.

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M&M giant keyseaters

M & M Giant Keyseaters, built in a range of sizes, speedily and accurately cut internal keyways or splines in the bores of pulleys, gears, fly wheels or any other machine part. Special fixtures and cutters are available for unusual shaped keyways and taper work. Send us your problems.

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There's a Walker Magnetic Chuck for Every Known Application . . .

For sixty years, Walker has specialized in the designing and production of magnetic holding devices. Today, Walker produces a complete line of magnetic chucks and designs special chucks to meet unusual holding problems.

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Standard Electro and Permanent Magnetic Chucks . . . Vacuum Chucks . . . Special Applications for various holding problems . . . Demagnetizers . . . Magnetic clutches.

Original Designers and Builders of Magnetic Chucks

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Over 300,000 circulation this issue.

NEWS gleaned from largest selection of Swiss Precision Machine Tools in the U.S.

HIRSCHMANN HIGHLIGHTS

ABOUT PRECISION CHC MACHINE TOOLS

PUBLISHED BY CARL HIRSCHMANN COMPANY, MANHASSET • LOS ANGELES • MILWAUKEE — APRIL, 1952

NEW WESTERN BRANCH

Largest selection of modern high precision Swiss machine tools displayed on the West Coast is at 5124 Pacific Boulevard, Los Angeles, Western Branch of Carl Hirschmann Co., whose executive offices are at 30 Park Avenue, Manhasset, N.Y.

NEW MIDWEST BRANCH

Showrooms and warehouse for complete machines, spare parts and factory service for all lines exclusively represented in U.S. by Carl Hirschmann Co., is being developed at 525 E.Michigan Street, Milwaukee. Russell T. Gilman is Executive Director.

PRECISION BALL BEARING MANUFACTURING

Precision Ball Bearing Manufacturers have taken a decided interest in Tornos Automatics for bearing races manufacture. Tornos Machines, slower than multiples, have proven to make up lost time by reducing and eliminating secondary operations.

AIRCRAFT INSTRUMENTATION

Leading U.S. instrument makers use Hauser Burnishing Machines for much of their super finishing work on small parts. The new Hauser Super Finishing Method with especially developed ceramic wheels has found many suitable and cost-cutting applications in the instrument field.

SWISS MACHINES TO U.S. STANDARD

Hirschmann disregarding additional manufacturing costs, is striving more and more to adapt Swiss machines to U.S. Standards. Most of their machines are not only built to such standards but also are equipped with U.S. fuse boxes, belts, switches and standard precision ball bearings.

AIR SHIPMENTS

In many emergency cases Hirschmann has made delivery of medium sized machine tools (2000 lbs) from Switzerland to Midwestern factories in 48 hours via transatlantic air freight service. Through special assistance by U.S. customs, air shipments are cleared with only a few hours delay in New York.

CAM AND TOOL SERVICE

Complete cam and tool service for Automatics is obtainable directly from Manhasset. Factory trained Hirschmann specialists assure accurate and prompt service.

DIAMOND WHEELS

Hirschmann has secured considerable quantities of diamond wheels, which are adaptable for most standard machines. Prices are somewhat above domestic wheels due to the fact that in Switzerland the diamond market is still operating on free market.

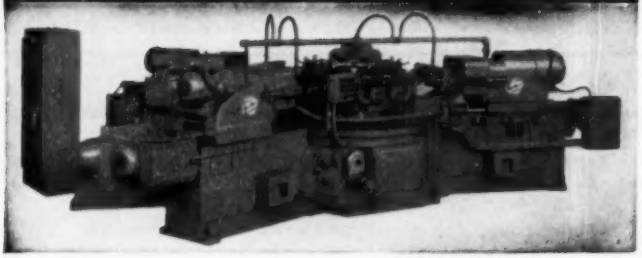
SPARE PARTS

Carried in stock at 30 Park Avenue, Manhasset, N.Y., is most every spare part necessary for Hirschmann machines. Large quantities of collets and carbide tools of every bore and size also are standard stock items.

If you want the complete issue of HIRSCHMANN HIGHLIGHTS regularly, write Carl Hirschmann Co., 30 Park Ave., Manhasset, N. Y.

Drilling and Reaming

388 KING PIN HOLES PER HOUR



Station Type Indexing Machine for drilling and reaming king pin holes.

On a Davis & Thompson 5 Station Machine

This type MDT FIVE STATION INDEXING DRILLER has five fixtures mounted on the index table. Each of these fixtures holds 2 RH and 2 LH automobile front suspension support arms. Four ROTO-MATIC Power Heads, each having four spindles, perform the following operations:

1. Drill 53/64" dia.—Half way through.
2. Drill .823" dia. — Balance of way through.
3. End Cut Ream .8547/.8550" — Full length of hole.
4. Finish Ream .8635/.8637"—Full length of hole.
5. Load and Unload.

Two RH and two LH pieces are completed at the end of each cycle. Cycling is automatic, and, operator loads and unloads during machine cycle.

4 New Davis & Thompson Mechanical Power Heads

Included in the design of this machine are the new ROTO-MATIC Mechanical Electrical Power Heads operated through screw feed. An important safety feature of these units is the patented overload release clutches on the feed. Because of the simplicity of their design the units require a minimum of servicing.

Free Data

Will be furnished on request.

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MODEL D-1 DIAL TYPE

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Automatic Lathes

• Versatile, as well as fast, the automatic lathe is capable of performing a large number of operations . . . turning, facing, chamfering, boring, and contouring.

How to Choose and Use AUTOMATIC LATHES

16 pages—25 cents each

This *American Machinist* Special Report, tells you how to obtain greater output and lower costs in the operation of your single-spindle units.

• Abundant with instructive photographs and drawings, copies of this report are available at 25 cents each.

• Similar Special Reports on the following topics are also available.

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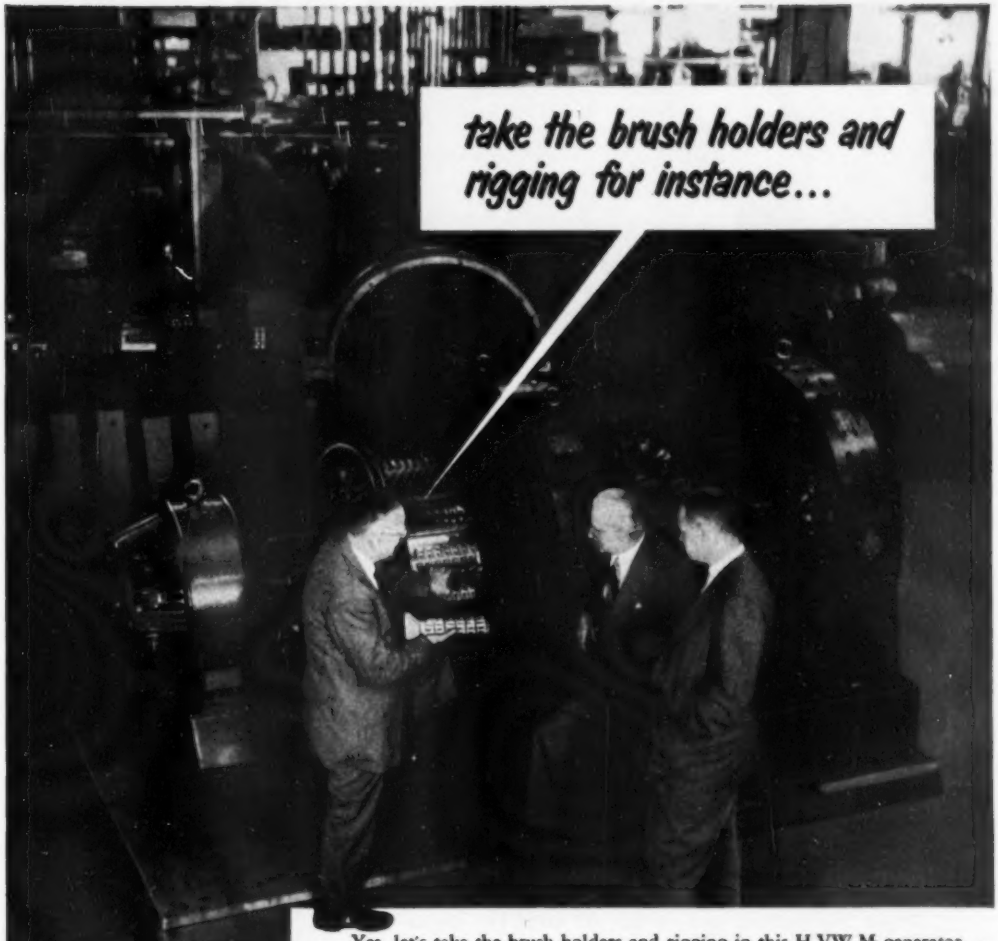

Yes, let's take the brush holders and rigging in this H-VW-M generator... they're fully insulated for longer life. Look, too, at the pigtail bar which eliminates current passage through springs and fingers. And the special copper graphite brushes—they give you optimum commutator efficiency. The molded "equaload" shunts distribute the brush load equally, minimizing selective action. And that's only the beginning...

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For technical information on low-voltage generators ask for Bulletin G-102.

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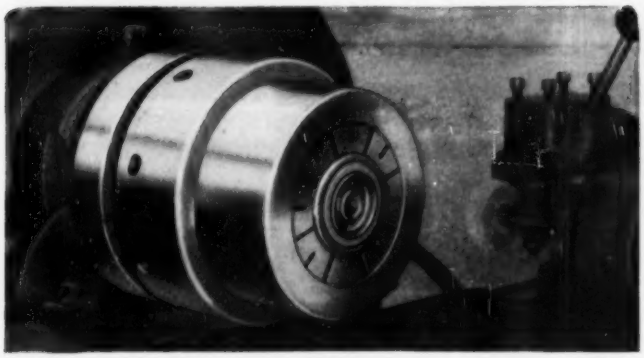

The tail that wags the dog...

In today's industrial plants, where greater precision and more production are essential to successful operation, the efficiency and speed of costly machines are all too often limited by obsolete work or tool holding methods.

The need for a "tail to fit the dog" has resulted in the development of the world famous line of ERICKSON Precision Holding Tools.

An example illustrated above is an ERICKSON CHUCK holding a rotor for precision grinding of a shaft hole.

Results reported: concentricity is assured, cost of operation reduced drastically, rejects eliminated.

Think of these Erickson tools in terms of your production problems:

- **COLLET CHUCKS** — replace 7 single purpose collets, prolongs tool life, GUARANTEED accuracy of .0003" T.I.R.
- **FLOATING HOLDERS** — correct both angular and parallel misalignment.
- **AIR CHUCKS** — compact, fast acting, tremendous gripping power.
- **EXPANDING MANDRELS** — Erickson principles applied to I. D. holding along entire length of holding tool. Positive grip. Instantaneous operation.
- **SPEED INDEXERS** — operate by air or hydraulics, vertically or horizontally.

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ERICKSON TOOLS
DIVISION OF THE ERICKSON STEEL COMPANY
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From the *American Machinist* Library of *Tips for Top Shop Men*

SLAVERY was not abolished by Lincoln. He did end physical slavery, but man himself must end mental slavery to habit. Education will help, but the real problem is to breed a race of open-minded, inquiring men who welcome the chance to wonder, to question and to analyze—then to take a chance on a new idea that looks sound.

PROCEDURE for methods improvement: Pick an operation to be improved. Put down in writing what happens—the details. Challenge each detail in order. Where a chance for improvement appears, develop the better method. Apply it on the job.

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offset ratchet handle reaches screws "YOU CAN'T GET AT"

CONVENIENT
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VERSATILE

No. 3600 "Yankee" Offset Handle and Adapters drive hollow head set screws, socket head cap screws, Phillips recessed head and slotted screws, even in hard-to-reach places. Select the Handle and Adapters for *your* job from the Merchandiser illustrated, at your distributor's. North Bros. Mfg. Co., 201 West Lehigh Ave., Philadelphia 33, Pa.

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CYLINDERS

Do You Have a
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PUSHING
LIFTING
or LOWERING
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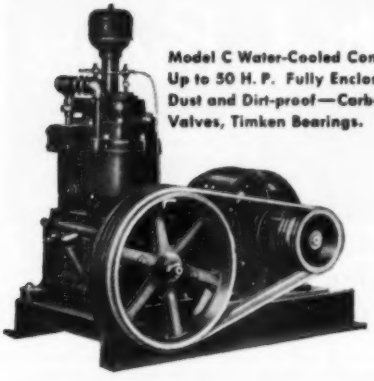
—For low-cost handling of materials, machines or component parts

Choose a **CURTIS AIR COMPRESSOR**
FOR INDUSTRIAL APPLICATION



Model C Water-Cooled Compressor, Up to 30 H. P. Fully Enclosed—Dust and Dirt-proof—Carbon-Free Valves, Timken Bearings.

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All Curtis equipment is precision made from top quality raw materials.

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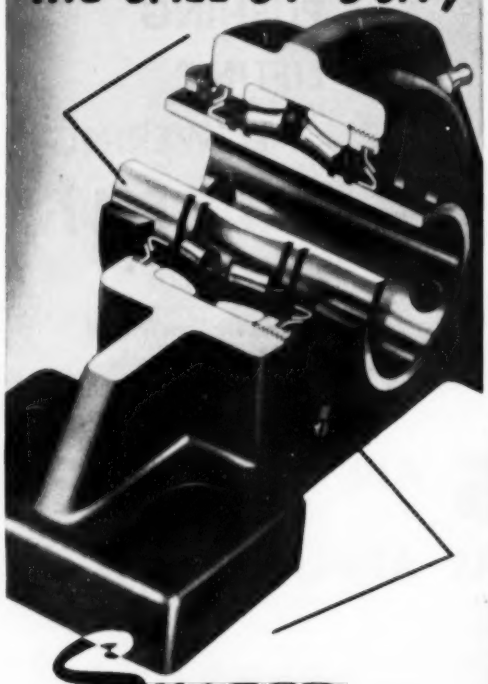

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Serving far beyond expectations in hundreds of different applications . . . in tens of thousands of plants and machines—such is the third-of-a-century record of Shafer ConCaVex Roller Bearings and Mounted Units. For, only Shafers give everything it takes for superior performance: Integral self-alignment • Full radial-thrust capacity • Exceptional shock load capacity • *Exclusive* Micro-Lock Bearing Adjustment • *Exclusive* self-centering, dirt-repelling "Z" Housing Seal.
Join the Industry-wide trend to "Shaferize" whenever the job is beyond reach of ordinary bearings—whenever you must have the final and complete answer to power transmission problems. Write for Industrial Catalog No. 51. Engineering counsel without obligation.

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Pillow Blocks • Flange Units • Cartridge Units • Flange Cartridge Units • Duplex Units • Take-up Units • Take-Up and Frame Units • Unmounted Bearings • Aircraft Control Bearings

KEYSEATING The Modern Way

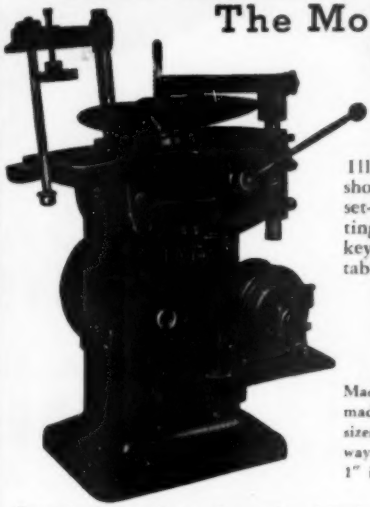


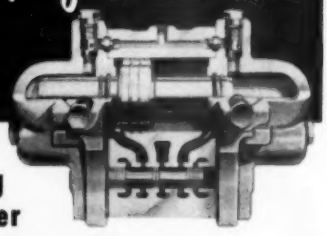
Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.
Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER, N. Y.

Multiply Pressure



without increasing horsepower

On most presses and in many other applications, pressure requirements change during the operating cycle. The Racine "Variable Volume" low pressure pump with a Racine Pressure Booster can be used to develop and hold up to 5000 psi. The horsepower input does not exceed the power needed to operate the pump at its low pressure setting.

This means lower first cost, less horsepower consumption, reduced cylinder sizes — a more compact over-all design. Pressure and volume delivered can be controlled by one of the built-in governors that are standard for all RACINE pumps.

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"Accuracy at Low Cost"

You Can Finish Holes Accurately, and 4 to 10 Times Faster Than Lapping

Sewing machine "looper carrier"
Material — Drop forging
Hardness — Rockwell 61 "C"
Hole Diameter — .250"
Length — 1"
Tolerance — .0001"
Finish — 15 micro-inches
Stock Removal — .0005" to .0007"
Honing Rate — 50 per hour

For holes ⅛" to 2⅝" in diameter—where accuracy and finish are important—you can't match Sunnen Honing Machines for precision at low cost.

Sunnen Honing cuts production time because it eliminates chucking, fixtures, and set-up . . . eliminates selective fitting . . . provides interchangeability of precision parts. Sunnen Honing is economical for single parts, job lots, and full-scale production.

Accuracy to .0001" is guaranteed; can be held to 25 millionths in some applications. Holes are geometrically true, free from bell-mouth, taper, and warpage. Sunnen Honing Machines will hone all metals (except babbitt), carbides, ceramics, glass, and plastics.

If you're concerned with close tolerances in hole production, send the coupon for free bulletin on Sunnen Honing Machines.

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Canadian Factory: Chatham, Ontario

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☐ Please send me information on Sunnen Honing. ☐ See enclosed data. Send recommendations. ☐ Please have representative call.

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Company _____

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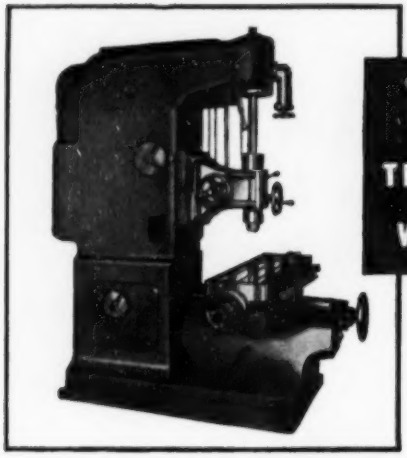

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Sixteen Spindle speeds, 40 to 2000 r.p.m.—9 Spindle feeds, .005" to .010"—100" rapid traverse per minute in both directions—16 Table feeds, ⅛" to 20" per minute.

KNIGHT NO. 50 VERTICAL MILLING & PRECISION BORING MACHINE

✓ *SAVES AT LEAST HALF THE SETUP TIME!*

✓ *ELIMINATES ALL WORK TRANSFERS*

✓ *SPEEDS UP OUTPUT—REDUCES UNIT COSTS*

- Fast, accurate, versatile, simple and easy to operate
- Handles an extreme range of difficult precision work
- Exceptional cross table travel—extra long spindle travel—complete selection of spindle and table speeds and feeds
- Rugged bed-type construction assures positive accuracy—7½ h.p. motor and all-gear drive furnishes ample power for biggest, toughest jobs
- Convenient, quick-action controls—full vision work areas—easy setup—all save labor, eliminate lost motion, lower unit costs, boost production!

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From the *American Machinist* Library of *Tips for Top Shop Men*

SOME wag said long ago that it isn't smart to step on other men's hands as you go up the ladder—you may need their help coming down. It's just as true that the man who makes his way up by slipping a knife in the back of the man above, spends his time up there ineffectually because he's always got one eye cocked over his shoulder, watching for the knife.

Wanted: a new kind of Crusader

. . . . to help fight the strongest foe in the world—*cancer.*

Who is he? *He is any generous person giving freely to the American Cancer Society's Cancer Crusade.*

He believes that the light in the "lab" must not be extinguished . . . that his fellows must learn to recognize the symptoms of cancer and the need for early diagnosis . . . that more doctors, nurses and research scientists must be trained.

A victory against cancer now may mean protection for you later. Won't you help us by giving freely—giving generously—giving now? Mail your contribution to "Cancer" care of your local post office.

Help us fight your battle
Give to the
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AMERICAN CANCER SOCIETY

How Lapping Improves Product Performance . . .

LAPMASTER Helps Trane Get Maximum Compressor Efficiency

Trane reciprocating compressor. Part shown in circle is valve disc which is lapped on Lapmaster.

Here's another interesting Lapmaster Installation. The Trane Company installed this machine for lapping the cylinder liner and valve parts of their reciprocating compressor. Its efficient operation produces a finish and fit that assures maximum compression and minimizes service and maintenance costs. In addition, the Lapmaster is used for producing a microfinish on the thrust collars of the Trane circulator.

Cylinder liner showing surfaces lapped on the Lapmaster. (See arrows)

New Method and Machine Design Offers Cost Reductions *PLUS* Consistent Accuracy

Lapmasters are extremely versatile lapping machines. Precision flatness and super finish can be generated in both small and large production runs. In one cycle, Lapmasters can precision lap either identical parts or parts of dissimilar shapes and materials. In addition, the self-conditioning lap plate, alone, accounts for tremendous cost savings because there is no loss of production time for replacing or reconditioning.

Operating view illustrating how Lapmaster handles both cylinder liners and valve plate in same cycle.

GET ALL THE FACTS

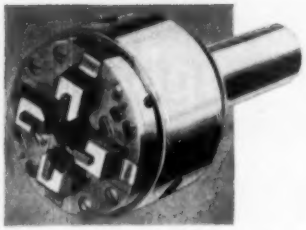
Actual production figures are given on five different size Lapmasters as well as the machine design features and specifications of this outstanding machine. Write Dept. No. AM-4.

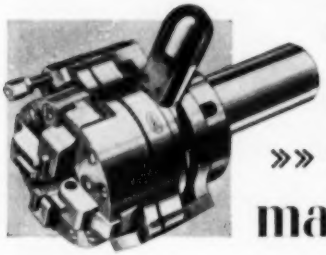
JOHN CRANE

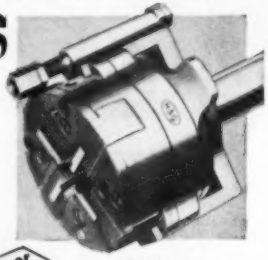
CRANE PACKING COMPANY

1836 CUYLER AVENUE, CHICAGO 13, ILLINOIS

An IDLE man at a BUSY automatic spells profits »» a BUSY man at an IDLE machine spells LOSS







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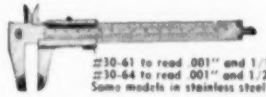

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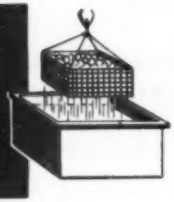

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for—Semi-Automatic / Fully Automatic—CUTTING

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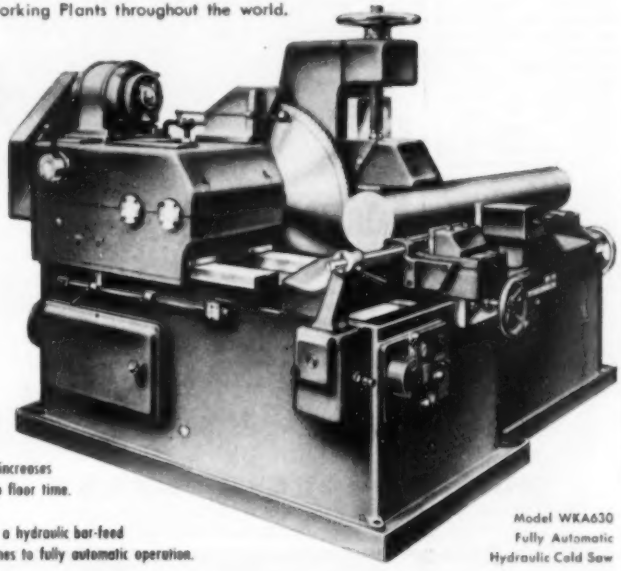

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Fully Automatic
Hydraulic Cold Saw

Wagner Cold Saws for Your Cutting Operations

SEMI-AUTOMATIC		WK500	WK630	WK800	WK1000	WK1250
Maximum Cuts	● Rounds	8"	10½"	13½"	16½"	21¼"
	I Beams	16" x 6"	20" x 6½"	24" x 7½"	24" x 7½"	24" x 7½"
FULLY AUTOMATIC		**WKA500**	**WKA630**	**WKA800**		
Maximum Cuts	● Rounds	7"	8½"	11½"		
	I Beams	15" x 6"	19" x 6½"	23" x 7½"		

All machines can be equipped with Mitre Vises for cutting mitres up to 45°

Write for Bulletin 39b fully describing these Cold Saws

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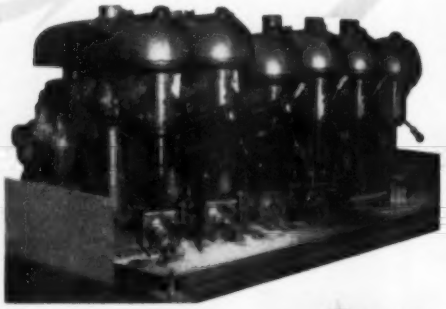
IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.

"Buffalo" DRILLS with pneumatic feed and air clamps result in 17% time saving



A special adaptation of "Buffalo" Multiple Spindle No. 15 Drills in drilling four small holes in a forged brass piston is shown here, in operation at *New York Air Brake Co.*, Watertown, N. Y. 0.070", 1.082", 0.76" and 1-32" diameter holes are drilled consecutively with the first four spindles. The work pieces are held on the jigs by ingenious air clamps, devised by the user. This permits quick placement and quick release of the work, effecting a 17% time saving. Here is an application calling for accurate, rigid drills with precision-built spindles—the way all "Buffalo" Drills are constructed.

The "Buffalo" No. 15-M Single Spindle Manufacturing Drill at right is built for continuous production work up to 1/2". Write for Bulletin 2965-F for facts on these rugged, versatile production machines.

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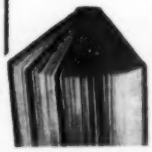

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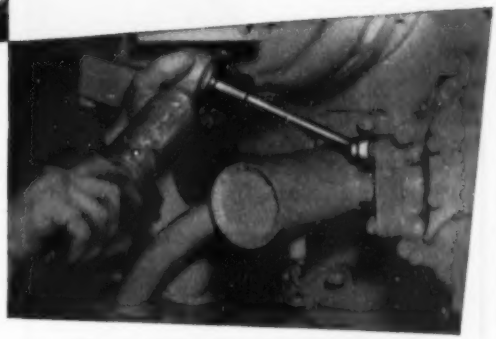

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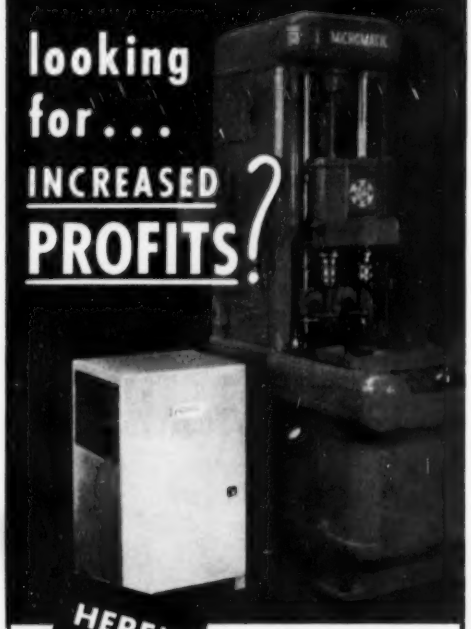

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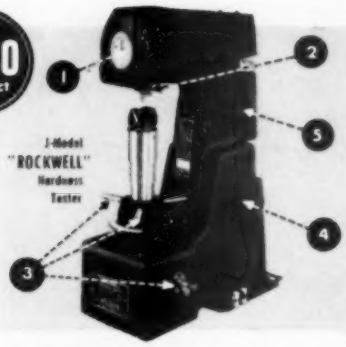

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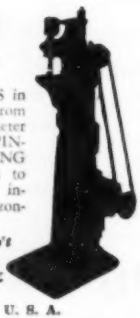

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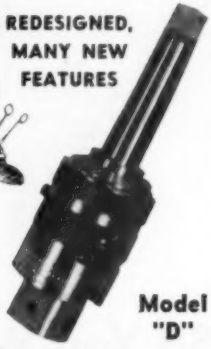

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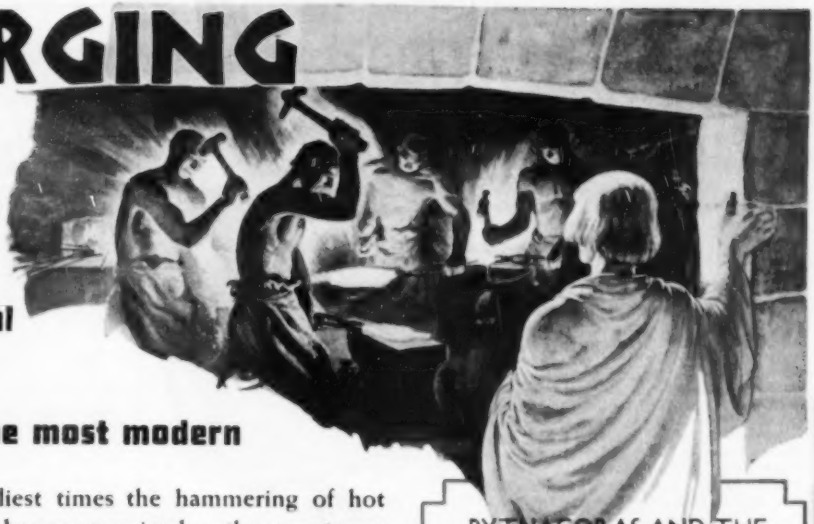
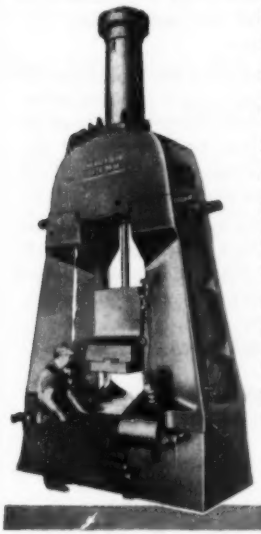


SINCE earliest times the hammering of hot metal has been recognized as the surest way of increasing the inherent strength of the metal and giving it added toughness.

Today, with speeds, pressures, stresses and strains to almost unbelievable limits, the importance of greater strength and toughness in metal parts is magnified immensely.



Chambersburg Hammers are at work in thousands of plants, imparting that added strength and toughness to the metal parts that make up our defense mechanisms as well as to the metal parts that make up such a large part of our peace-time economy.

PYTHAGORAS AND THE FIVE HAMMERS

IT is related that Pythagoras, greatest of the Greek scientists, who was born about 570 B.C., was working on his theory of the musical scale when he passed a blacksmith shop. The musical chime of the hammers gripped his attention. He went in the shop and found five smiths working. "Might he weigh their hammers?" He did so, finding four of them in the proportions of 12, 9, 8 and 6. (The fifth, which had been spoiling the harmony of the chime, bore no musical relation to the rest.) From this, the great Ionian scientist worked out his theory of the fixed notes in the musical scale.

The modern forging hammer is no musical instrument and the chime of hammer and anvil is still confined to the blacksmith shop, but the strengthening effect of hammering on metal is as true today as in Pythagoras' time.

CHAMBERSBURG ENGINEERING COMPANY
Chambersburg Pennsylvania

CHAMBERSBURG

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Procunier Tapping attachments have established a reputation for outstanding performance in the tapping industry. They have helped increase output capacity, and have reduced maintenance, operating and spoilage costs to a minimum. Developed by practical craftsmen—who have concentrated exclusively on developing, improving and perfecting tappers for more than 30 years—Procunier tappers offer the rare combination of high speed, dependable accuracy, lasting endurance and economy of operation. Special exclusive construction features enable them to cut threads **faster, for longer periods**—with fewer spoiled pieces, fewer rejects. Here's why:

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The exclusive Procunier "Tru-Grip" tap holder is lighter, smaller in diameter. It affords easier tapping close to walls or shoulders; eliminates "chewed" tap shanks. Holds tap true.

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Microstructure determines tool life . . .

U. S. AIR FORCE MACHINABILITY REPORT 1951

This *American Machinist* Special Report summarizes recently released data from the $100,000 machinability - research project conducted by Curtiss-Wright and other companies for the United States Air Force.

You will find particularly valuable, as a key to estimating the tool life cutting speed of any steel, this report's complete chart of the tool-life curves of 12 steel structures under four metallurgical conditions.

Copies of this 8-page Special Report, which includes information on machinability as influenced by heat-treating and alloying, are available at 15 cents each.

The following other Special Reports, based on the U. S. Air Force Machinability - Research Project, are also available:

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16 pages — 25 cents a copy

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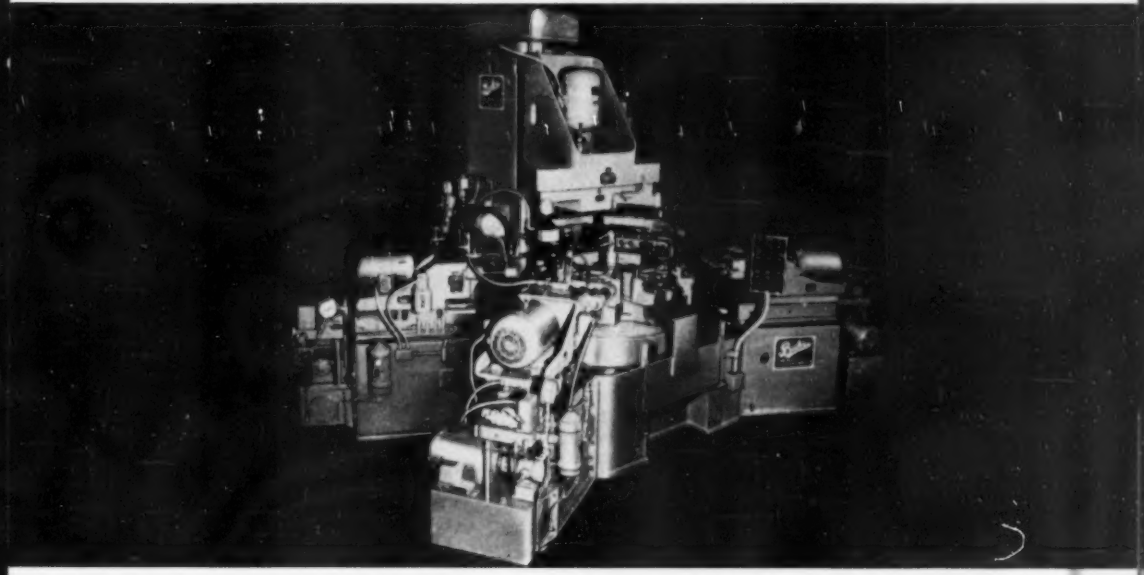
WHY DOAKES GETS FROM BANFF TO TALLAHASSEE



What are the travel and automobile agencies reporting every season? . . . That Joe Doakes—the typical American—is taking more vacation and traveling farther year after year . . . And here's one of the reasons why—this Buhr Five-Way Horizontal-and-Vertical Hydraulic-Feed Drilling Machine . . . the Machine which one of the world's leading Auto Makers uses "around the clock" for producing Rocker Arms in such volume and at such low cost that . . . Joe Doakes may afford to drive thousands of miles for vacations—literally from Banff in west Canada to Tallahassee, Fla.

Auto Maker Chooses This to Turn Out 880 Pieces an Hour for Utmost Economy

As each new model comes off the auto assembly lines, the battle to cut production costs becomes more intense. Not long ago, one of the big auto companies concentrated on how to make a certain rocker arm most economically.

Here Was Their Problem

To secure a piece of production equipment which would perform 7 operations on the rocker arm, including tapping, drilling, endmilling, chamfering and spotfacing—that was the problem.

As the company to design and manufacture the Special Machinery to solve this problem, they chose Buhr.

What the Machine Does

In general—it drills 8 holes, drills through 4 more holes, taps 4 holes, endmills 4 places, spotfaces 4 places and chamfers 4 previously drilled holes. It is equipped with 42" automatic Index Table and six-station Holding Fixture, loading four parts per station. Parts are automatically clamped while fixture moves from loading position into first working station, and are automatically unclamped while Fixture moves from last working station to unloading.

Specifically, the Machine does this—

Station 1—Load and Unload

Station 2—Vertical, idles; Horizontal, taps and drills (4) $\frac{7}{16}$-20 holes

Station 3—Vertical, endmills (4) $\frac{1}{2}$" Radius places; Horizontal, chamfers (4) previously drilled holes

Station 4—Vertical, drills (4) $\frac{1}{4}$" dia. holes $\frac{5}{16}$" deep; Horizontal, idles

Station 5—Vertical, drills (4) $\frac{3}{8}$" dia. holes through; Horizontal, spotfaces (4) $\frac{15}{16}$" dia. places

Station 6—Vertical, idles; Horizontal, taps (4) $\frac{7}{16}$-20° S.A.E. holes

PRODUCTION—880 pieces per hour at 100% efficiency.

Why Buhr Was Called In

Leading Automobile Manufacturers have done business with Buhr for more than a quarter-century. . . . They know Buhr's record for dependable Special Machinery . . . and for delivering on time. . . . They're familiar also with Buhr's excellent manufacturing facilities . . . and their experienced, trustworthy and specialized sales and engineering staffs. Consequently . . . for Special Machinery like this . . . it is second-nature for them to call Buhr.

For Details About Buhr

A comprehensive Catalog . . . or a personal call from a Buhr Sales Engineer . . . is yours for the asking wherever you are located in the United States! . . . For every problem involving this type of Special Machinery—including the type which helps Joe Doakes get from Banff to Tallahassee—phone, wire or write us.

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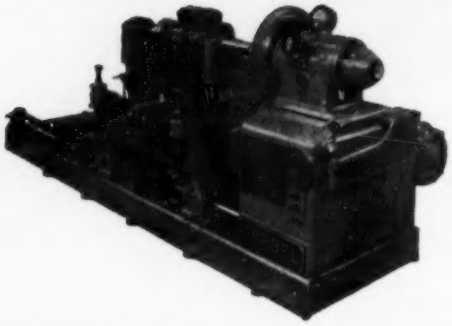
IMMEDIATE PRODUCTION SHORT CUT



New Dynamic Balancing Principle checks unbalance of rotating parts in Less than a Minute

No special skills are required to operate the NEW TREBEL DYNAMIC Balancing Machine. Just place the work in the machine, push the starter button, make two handwheel settings and get direct, accurate readings of the amount and location of unbalance—all in less than 60 seconds. That's why one TREBEL machine now balances as many 60-100 H. P. rotors in *one hour* as formerly required an entire shift with other methods.

Unique Balancing Principle using a counter force to compensate for unbalance eliminates complicated set-ups and makes possible the indication in simple, easy-to-read units such as length of wedges in inches, or depth of a standard diameter hole, etc.

Lower initial and operating cost – and little maintenance – makes the TREBEL worth your investigating *now*. Delivery is prompt, too. May we send you full details?

See this machine in operation in New York, Detroit or our Cleveland Service Center

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SABOTAGE is a greater potential danger for most plants than bombing. Have you taken any precautions to guard against it?

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THERE'S an old saying that "If you want to be big, you've got to look big." Nobody likes a fourflusher or a fop, but everybody has been trained from childhood to expect a leader to look like one. Company policy can't earn respect on the major things either, if it is small on the minor things. Don't make your company look small.

Air Powered Feeding Helps Inexperienced Operators

Dunnington Manufacturing Co. uses Bellows Rotary Feed Table and Air Motor in unusual set-up — cuts costs from .005 to .0017

In large or small plants, high production today requires ingenuity. Special machines aren't quickly available. Sometimes they have to be built from scratch, or developed from standard components. Bellows "Controlled-Air-Power" Devices offer a practical and economical starting point.

The basic devices: air cylinders, air motors, air-operated power drills, drill press spindle feeds, rotary work feed tables, and work holding and clamping devices, are complete power units in themselves, with built-in manual or electrical controls. They are used as components in tool-room built production equipment, or to convert manually operated machines to semi-automatic or automatic operation. Their precision controls permit even inexperienced operators to handle close tolerance work at high production rates with minimum fatigue, and few rejects.

The current Foto-Facts File showing typical applications of Bellows equipment in 20 diversified manufacturing plants, with wiring diagrams and installation details, is free on request. Write Dept. AM-452, The Bellows Co., Bellows Bldg., Akron, Ohio.

The tool room unit shown above is press-fitting two hardened bushings into a spacer at 2000 complete units per hour. The upper photo shows the operator inserting parts on the 20-station Bellows Rotary Feed Table. The lower photo shows the Bellows Air Motor used to press the bushings into the spacer.

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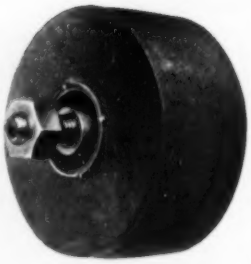

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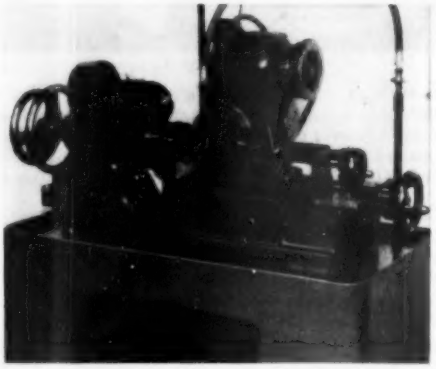

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. . . for producing accurate, fine-finish threads on small diameters at low cost

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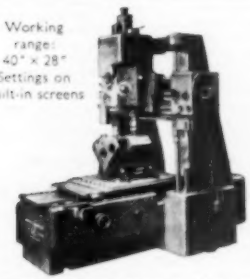
Working range: 40" × 28" Settings on built-in screens



HYDROPTIC-6. Two-coordinate Jig Boring and Milling Machine. The latest addition to the SIP range.

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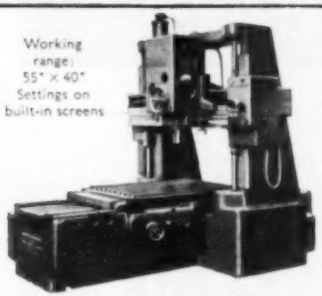
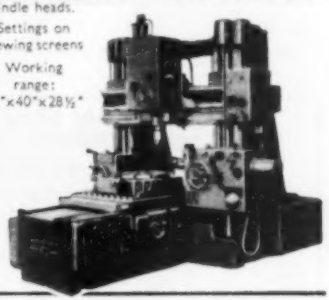


HYDROPTIC-7 P. Two-coordinate Jig Boring and Milling Machine combining power, speed and precision.

HYDROPTIC-8 P. Three-coordinate Jig Boring and Milling Machine with vertical and horizontal spindle heads.
Settings on viewing screens
Working range: 55"×40"×28½"



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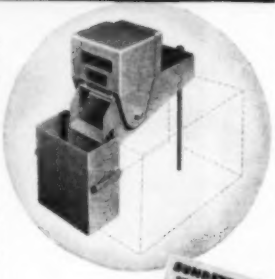

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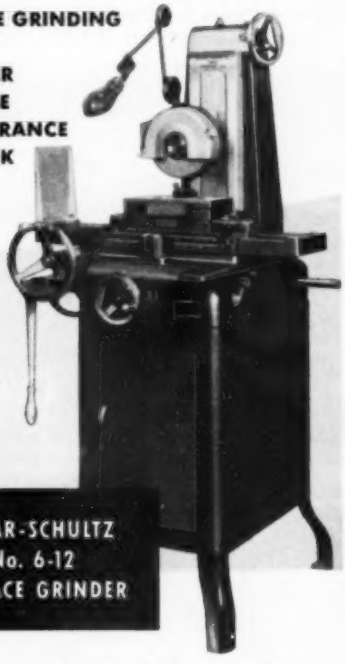

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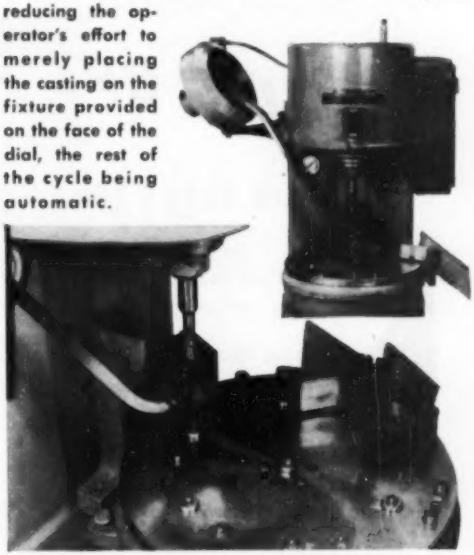

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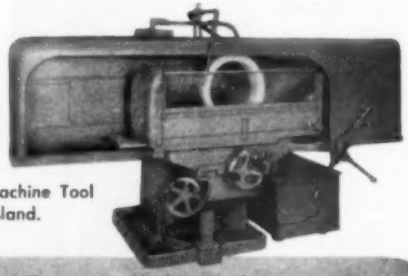

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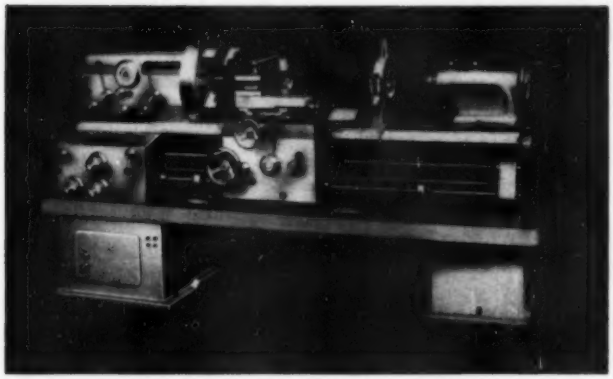

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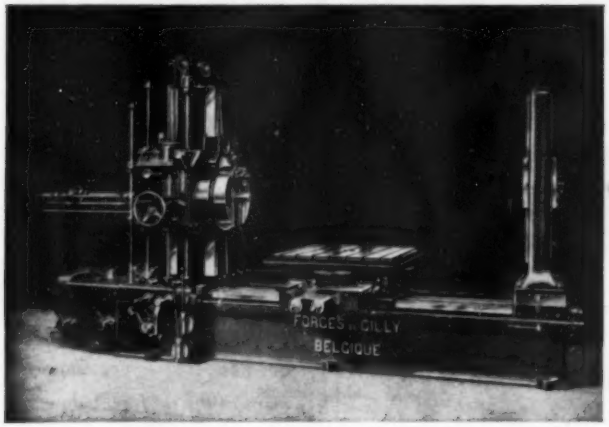

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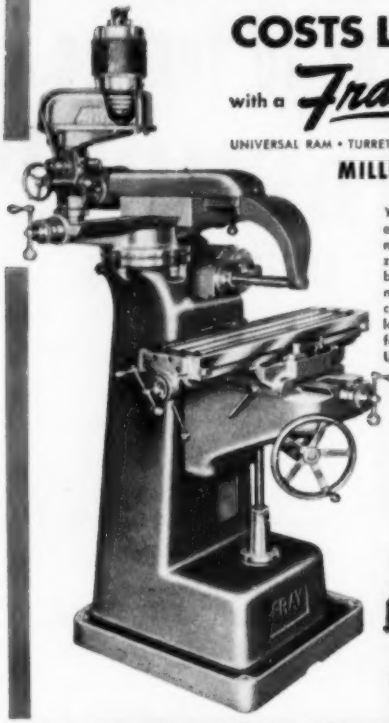

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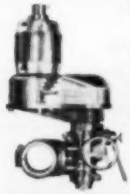

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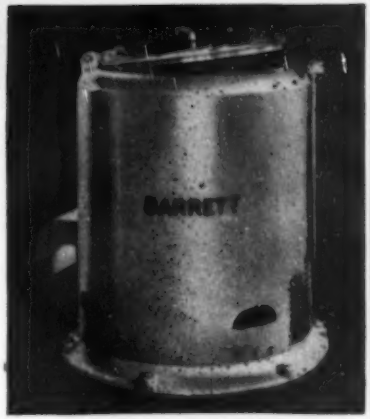

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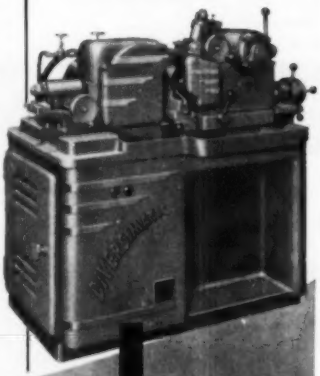

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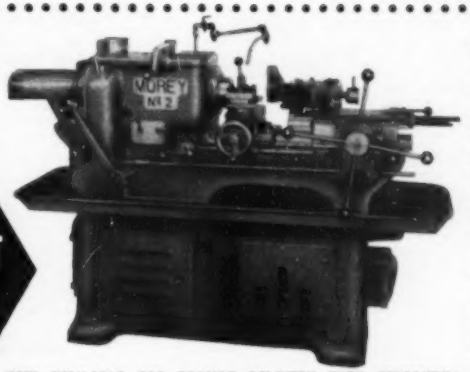

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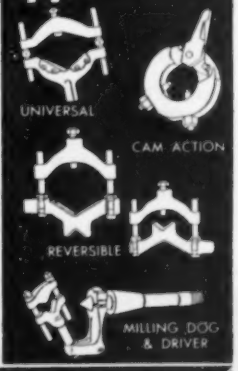

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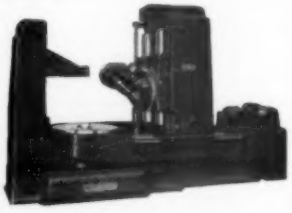

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6' American Radial Drill, Ser. #55502
32" x 25' Centers Pittsburgh
Hammerfeld Heavy Duty Engine Lathe, new 1942
Toone Heat Treater, Serial No. TJ-684
#3 Brown & Sharpe Vertical Milling Machine
60" Hanchett Face Grinder
Bausch Multiple Spindle Drill, Type W7
6D Potter & Johnson Automatic Chucking Machine
#50 Waterbury Ferrell Thread Rollers
#8 Brown & Sharpe Automatic Screw Machines with Turret Drives
01-A Acme Gridley 1½" Automatic Screw Machine
10" Gould & Eberhardt Shaper
(2) #3 Cincinnati Millers-Ser. A1604 A and A1604 B

HAZARD BROWNELL MACHINE TOOLS, INC.
350 Waterman St., Providence, R. I.

NEW LATHES AT BARGAIN PRICES

New 18" x 80" Centers MEUSER LATHE and 24" x 120" Centers MEUSER LATHE. Complete with Taper Attachments, Chucks and all equipment. *GAP BED TYPE.* Available from stock all sizes up to 32" Swing. Will trade for other equipment.

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1—DeLaval Chip Wringer—2 hp. cap.
1—Red Ring Gear Shaver 2-GCC-20S
1—N.B.P. 6"x½" Initial Type Open End Rolls
2—GG-19 Gear Grinders
1—ARTER A3-12 Surface Grinder
1—Chandler 36"x36"x24" Planer, 4 heads

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AUTOMATIC, #50 Brown & Sharpe, 5/16" cap.
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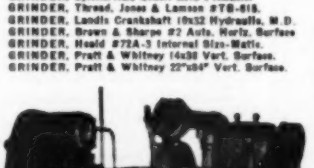
AUTOMATIC, B & S #20, 1" Cap. M.D.
AUTOMATIC, National-Acme Spls. Spdl. 4½".
BALANCER, Anderson Bros. 14"x84", Auto-Checker
BORING MILL, 2½" Universal, Horiz. Motor Driven.
BORING MILL, 30" Baths Vert. 2 heads.
BORING MILL, 19" Cincl-Vert., M.D. 2 Swivel Heads.
BORING MILL, Lucas #31 Horiz. 3" Bar.
BORING MILL, Riddings & L. #32 Horiz. 3½" Bar.
BORING MILL, 24" Bullard M.D., V.T.L.
BARRELS, Tumbling Lupomatic, Baird.
BRAKE, Chicago #612 Hand Bending.
BROACH #1 LaPointe Horiz. 20" Str.
COMPRESSOR, Ingersoll Rand ER-1, 10 HP. M.D.
COMP., 15 HP, 10 HP, Gardner Denver, M.D., Pro.
CRANE, GET Shaw 15 tons, 58'8" span.
CRANE, Canton #8 Portable Gooseneck 3 ton cap.
CRANE, GET Ricker 2 tons 11'9" span.
CHIP WRINGER, Garrett #251, M.D., 18" dia.
CUTTER, 74" Owens Automatic Wiper, M.D.
RADIAL DRILL, 5'0" American, M.D.
RADIAL DRILL, 5'0" Mueller, M.D.
RADIAL DRILL, 4'x11" American, M.D.
RADIAL DRILL, 5'10" Cincinnati-Bickford
RADIAL DRILL, 8'10" American, M.D.
RADIAL DRILL, 30" Walker Turner M.D., Late.
DRILL, Fondiet 16", S.S. Power Feed, M.D.
DRILL, #2 Colburn H.D. #4 M.T., M.D.
DRILL, #121 Baker Auto. S.S. Cam Operated.
DRILL, Deep Hole, Avey-Drastic #2.
DRILL, Deep Hole, Pratt Whitney #2 Gun Barrel
DRILL, Edlund #28, 3 spdle. #2 M.T., 19".
DRILL, Cincinnati 21" with Tapping Attach.
DRILL, Nutco Multiple Spdle #12, #1 M.T.
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4
DRILL PRESS, #2MS Buffalo Forge single spindle
DRILL, Barnes, 24" S.S., #4 M.T., 1¾" cap.
DRILL PRESS, #25 Foote-Burt S.S. 24", #M.T.
DRILL, #2MS Leland Gifford, 4 spindle, #2 M.T.
DRILLS, #14, #15, #16, #18 Buffalo Forge, M.D.
DEEPFREEZE Motor Products 40° below zero.
DEMAGNETIZER, SB-811 Magnaflux, late type.
FILER, #11-S Cochrane Bly Auto Saw Filer.
FILER, Oliver Type P4, Floor Type, M.D.
FURNACE, Westinghouse Elec. 18 KW, 2100° F. cap.
FURNACE, Machler Steam Oven, Serial #3543.
GRINDER, Disc, Besly #20S, 18" Dbls. End.
GRINDER, Arbe 18" Rotary Surface.
GRINDER, Cylindrical, Brown & Sharpe #2 Uni.
GRINDER, Heald Rotary #2S, M.D.
GRINDER, Hydraulic Contour Landis Cam 9"x60".
GRINDER, Cylindrical, Norton 10"x24", M.D.
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, Cylindrical, Cincl. 6x18 Filmatic.
GRINDER, Thread, Jones & Lamson #TG-618.
GRINDER, Landis Crankshaft 10x32 Hydraulic, M.D.
GRINDER, Brown & Sharpe #2 Auto. Horiz. Surface
GRINDER, Heald #72A-5 Internal Size-Matic.
GRINDER, Pratt & Whitney 14x36 Vert. Surface.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.

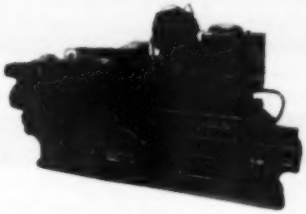


LANDIS 6 x 18 Hyd. Cyl. Grinder, Type C. Serial #29196.

GRINDER, Greenfield #12 Int. Hydromatic
GRINDER, #51 Oliver Auto. M.D. Drillpointer.
GRINDER, #33 Abrasive Vert. Auto. Surface.
GRINDER, McDonough Univ. T & C. Late.
GRINDER, #22 Heald Horiz. Rotary Surface.
GRINDER, Diamond Snagging 10 HP, 24"x4½".
GRINDER, Norton 6x18 Vert. Surface, Hyd. Late.
GRINDER, #1 Moore Jig M.D. Late.
GRINDER, #00 & #70 Heald Internal.
GRINDER, Landis 9"x18" Hyd. Cyl. late type
GRINDER, Sellers Type #1A Tool, 24" wheel
GRINDER, Porter-Cable #8-S, 10" Belt, M.D.
GEAR HOBBER, #3 Barber Colman, M.D.
GEAR HOBBER, B & S #34 Sour. 18" dia.
GEAR SHAPER, Fellows #6 High Speed.
GEAR SHAPER, Fellows #7 High Speed.
HAMMER, Rochester Hispeed, all sizes M.D.
HAMMER, Bradley 2000# Rubber Cushioned Helve.
HEADER, Manville #1 S.S.S.D. Cold, 5/16"
INDUCTION HEATER, 15 KVA, Ecco HI Frequency.
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 200-4000 lbs. Whiting, NEW.
KEYSEATER, #5 Witte & Merrill Giant, M.D.
LAPPER, 19" Norton Vert., M.D., late type.

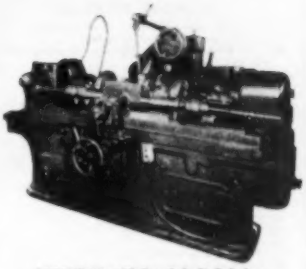
DISC GRINDER

Osterheim 37" Wheel Diameter Disc Grinder. 40 HP. TEFC 3/60/440 spindle motor drive. 24" capacity.



LANDIS Type "D" 5" x 40" Motor Driven Hyd. Semi-Auto. Cam Contour Grinder. Equal to New.

LATHE, La-Swing 8"x100", M.D., A.C.
LATHE, Porter-Cable 9"x15" Geared Head Prod.
LATHE, Hendey 12"x5", G.C.G. Taper Attach.
LATHE, LeBlond 14"x8", G.C.G.
LATHE, Hendey 14"x8" G.C.G. Taper Attach.
LATHE, Lodge & Shipley 16"x8', G.C.G., Grd. Hd
LATHE, American 16"x10' G.C.G. Grd. Hd.
LATHE, Lehman 16"x7' G.C.G., M.D.
LATHE, Lodge & Shipley 18"x8', G.C.G., Gr. Hd.
LATHE, American 18"x10' G.C.G., Grd. Hd.
LATHE, South Bend 18/28"x8' Gap Bed, G.C.G.
LATHE, Hendey 29"x10' G.C.G., Taper Att.
LATHE, Reed-Prentice 30"x10' Grd. Hd.
LATHE, LeBlond 22"x10' G.C.G., M.D.
LATHE, Putnam 24/32"x12' G.C.G., M.D.
LATHE, LeBlond 24"x14' G.C.G., Grd. Hd.
LATHE, Lodge & Shipley 29"x14', G.C.G., M.D.
LATHE, McCabe 28/48"x18' Double Spindle Lathe.
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, Bridgeford 32"x16' G.C.G., Grd. Hd.
LATHE, Pond 36"x108" Grd. Hd. With Equip.
LATHE, Bullag Dbls. End #VMTS, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret, #2 Simmons Vari Drive 220 V.
LATHE, Turret, #4 Warner & Swasey Univ. 1½".
LATHE, Turret, #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cincl. Acme Univ. Geared Head.
LATHE, Turret, #3A Warner & Swasey Univ. M.D.
MILL, #4 Burke Motor Drives, Late.
MILL, 30 H. Sundstrand Horiz. Hyd. 2 Sp. M.D.
MILL, Nichols, Hand, Coolant, M.D. Late Type
MILL, #2 Pratt & Whitney Prod. Duplex, M.D.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #0Y Brown & Sharpe Plain Horiz., M.D.



LANDIS 10 x 32 Crankshaft Grinder.

MILL, Cinc. Horiz. #3, #4, #5, High Power.
MILL, #3 Cinc. Univ. Horiz., M.D.
MILL, #3C Becker Vert. Die Sinker, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #0-8 Cinc. Vert. & Horiz. Prod. Late.
MULT-MILLER, U.S. Tool #MM-1-6, Auto. Prod.
MILL, #0 Vernon Hand Mill, M.D. Late
MILL, PLANER, Ingersoll 42x36x12, 4 heads.
MILLING MACHINE, LeBlond #4, Horiz. Univ.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILLING, Brown & Sharpe #2 Horiz. Univ.
MILLING MACHINE, Van Norman #2 Duplex.
MILLING MACHINE, F & T #2B Horiz., M.D.
MOTOR GENERATOR SET, Gen. Electric, 100 KW.
NIBLER, Gray Turret Type ⅝"x24" cap.
NIBBLER, #2 Sauge Roller Die ⅝"x36" cap.
OZALID Model "P" Whiteprint Machine, Late.
THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILLER, Lees Bradner #40A Automatic
THREAD MILLER, Pias-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.
PAPER SHREDDER, No. 10 Witte & Merrill, M.D.
PLANER, Cincinnati 30"x30"x12' A.C., M.D.
PLANER, 48"x48"x12' Cleveland Openside.
POWER PRESS, Bliss #184 Open Back.
POWER PRESS, Bliss #3A S.S. Dbls. Crank Grd. 45 tons, 4" stroke, 30"x24" Bed Area.
POWER PRESS—Bliss-Consolidated #160-B Straight Side Dbls. Crank, 45 tons.
PRESS, #70½ Bliss S.S. 9½" Str. M.D.
PRESS, Robinson #3 O.B.I. 60 tons, M.D.
PRESS, Federal #2 O.B.I. Grd. 2" Str.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS Toledo 58½ S.S. 440 ton cap. 8" str.
PRESS, Waterbury-Farrell High Speed 60 tons #3W.
PRESS, 56C Bliss Double Action, 3 week.
WHEEL PRESS, Chambersburg 400 tons cap. Hyd.
PRESS, Lucas 10 tons Power Arbor M.D.
PRESS, #60 Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Ferracute M.D. Roll feed.
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, Hooker Turret, 8 station, cap. 3½" hole
PUNCH, H & J #2 Spls. End, 24" Thr. 1" thru 1".
PUNCH H & J #3 Spls end, 40" Thr. 2" thru 1½".
RIVET SETTER, ⅝" cap. Pneu. Tubular Rivet.
ROLLS, #1 Buffalo Forge Vertical Bending, NEW.
ROLLS #1 Buffalo Forge Wrapping, M.D.
ROUTER, #W2400, Geared, Electric H.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade.
CUT-OFF SAW, Yates-American #M-90.
SAW, #302 Campbell Abrasive Cut-off.
SAW, #20-C Racine Shear Cut 6"x9" cap.
SAW, #310 Abrasive Cut-off, New
SAW, Band, Tannewitz AGH-36" High Speed.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 32" Cincl. S.S., Motor driven.
SHAPER, Columbia 32" S.S. Crank.
SHAPER, Marion 36" Draw-Cut, 4-Speed.
SHAPER, G & E 24", high duty, back geared, M.D.
SHEAR, Quickwork #-1 Rotary 60" Throat, 18 ga.
SHEAR, #8E Niagara M.D. 8'x3/16" cap.
SLOTTER, 12" New Haven Vertical, M.D.
SPRUE CUTTER, Milwaukee 36 tons, 2½" cap.
SURFACE PLATES & TABLES, all sizes.
TAPPER, #1 CAM Hashine, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
WELDER, 200 KVA Federal, Projection.
WELDER, 75 KVA Federal, M.D., Spot.
WIRE STITCHER, Morrison and Acme, M.D.

OTHER 2000 MACHINE TOOLS AVAILABLE "IN STOCK"

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY—THE MARK OF DEPENDABILITY

UNIVERSAL CYLINDRICAL GRINDERS

6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d., latest
12x36" Cincinnati Self-Contained, m.d.
12x48" Cincinnati, arranged for spline grinding
16x48" Cincinnati, belted m.d.
16x24" Cincinnati Self-Contained, m.d.

CYLINDER GRINDERS

No. 50 Heald Hydraulic, m.d., 11-18" spindles
No. 55 Heald, m.d., 15-24" spindles
No. 75 Heald Airplane Cylinder Grinders, brand new, m.d., late type

THREAD GRINDERS

No. 19A Excello Internal, m.d., latest

INTERNAL GRINDERS

Wicaco Precision Internal Grinder, m.d., swing 12"
No. 10—22" Bryant, m.d., latest
No. 10RS Bryant, m.d., latest
No. 10—30" Bryant, m.d., latest
No. 9 Cincinnati, belt
No. 6 Bryant, belt
No. 24—21" Bryant, m.d., late
No. 70 Heald, belt
No. 70A Heald, m.d., late type
No. 72A Heald Gagematic, m.d.
No. 72AS Heald Sizematic, m.d.
No. 72A3 Heald Gagematic, m.d.
No. 72AS Heald Sizematic, m.d.
No. 72AS Heald Plain, m.d.
No. 72AS Heald Plain, long bed type, m.d., latest
No. 75 Heald Airplane, m.d., brand new, latest
No. 74 Heald, m.d.
No. 104 Rivett, m.d., latest
No. 049—10" Van Norman Automatic Oscillating Radius, m.d., latest
Series 5—No. 5 Bryant, m.d., latest

SURFACE GRINDERS

Arter Model A-1-6" Rotary, m.d.
No. 121 Hanchett Production Face Grinder, type BD, m.d.
No. 22—12" Heald Rotary, m.d.
No. 33 Abrasive Vertical, m.d.
No. 200—16" Heald Rotary, belt
14" Pratt & Whitney Vertical, m.d.
22" Pratt & Whitney Vertical, m.d.
81" Diamond N.D. Face Grinder, m.d.

HAND MILLING MACHINES

No. 1 Garvin, m.d.

MANUFACTURING TYPE MILLING MACHINES

Rowbottom Cam Milling Machine
Model 1400 Milwaukee Simplex Production Milling Machine, m.d.
5A Sundstrand Copy Rigidmill, m.d.
Type P Ohio Mfg., m.d.
4" Pratt & Whitney Spline, m.d.
No. 33 Kempsmith, s.p.d.
18", 24" Cincinnati Plain Automatic, m.d.
24" Cincinnati Duplex Automatic, m.d.
No. 21 Brown & Sharpe Automatic, s.p.d.
46"x48"x20" Ingersoll Fixed Rail Milling Machine, for tank work
Carter & Hakes, m.d.
48"x16" Slab Miller, Newton, m.d.

PLAIN MILLING MACHINES

No. 3B Milwaukee, m.d.
No. 1B Milwaukee, m.d.
No. 1M Cincinnati, m.d.
No. 1½ Cincinnati, cone
No. 3 Van Norman Duplex s.p.d.
No. 2 Rockford, m.d.
No. 2G LaBlond, belted m.d.
No. 4 Ohio, cone
No. 3G Van Norman, m.d., p.r.t.

THREAD MILLING MACHINES

14"x16" US Automatic Hob, m.d.
Hall Planetary, m.d.
41½x12", 6x14", 6x20", 6x48", 6x80" Pratt & Whitney
10x24" Hanson Whitney, m.d., latest

UNIVERSAL MILLING MACHINES

No. 2A Brown & Sharpe, s.p.d.
No. 2 Kempsmith, cone, motorized
No. 3 Kempsmith, cone

VERTICAL MILLING MACHINES

Sundstrand Rigidmill, m.d., vertical spindle
No. 0B Cincinnati, m.d., latest
No. 2½-D Milwaukee, m.d.
No. 3V Toledo, s.p.d.
No. 6 Becker, cone
Newton Vertical Miller, rotary table

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CABLE ADDRESS EMCO

LATE MODEL MACHINE TOOLS . .

AUTOMATICS

1½" RA-4 Acme Gridley Automatic, Late
9/16" RA-6 Acme Gridley Automatic, 1942
1¼" Cleveland, Model A, 1943
#47A Heald Borematic.

DRILLS

No. B2A Natco Single Spdl, Latest
10 Spindle Barnes, Hydraulic, 1942

DRILLS, RADIAL

6' Hammond, New
5' 11" Archdale, 1947

DRILLS SENSITIVE

No. 2 Allen Single Spindle, 1942
No. 2B-E Edlund, 1942

GEAR EQUIPMENT

No. 6 Gleason Revacycle Generator, 1940
No. 64SA3 Fellows Gear Shaper, 1943
No. 61SA Fellows Gear Shaper, 1942
No. 72 Fellows Gear Shaper, 1942
No. 7LS Fellows Gear Lapper, 1942
Pratt & Whitney Gear Grinder, 1942
8" Red Ring Gear Shaver, 1941
12" Red Ring External Lapper, 1942
Red Ring Universal Gear Checker, 1942

GRINDERS, CYLINDRICAL

14"x100" Norton Plain Type C, 1942
14"x60" Landis Type C, Pl. Hyd, 1943
10"x18" Landis Type C, Pl. Hyd, 1942

GRINDERS, INTERNAL

No. 24-36 Bryant Hydraulic, 1943
No. 10 CP 10 Bryant Hydraulic, 1942
No. 10-16 Bryant Hydraulic, 1942
No. 172 Heald Hyd. Cap. 1940
No. 50 Heald Plain Hydraulic, 1941

GRINDERS, SURFACE

No. 22 Heald Rotary, 12" Chuck, 1943

GRINDERS, THREAD

No. 31 Excello Thread Grinder, 1941

GUN BARREL MACHINES

No. ½-Bx50 P & W Reamer, Latest
No ½-Bx50 P & W Rifler, Latest
No. ½-Bx30 P & W Reamer, Latest

LATHES, PRODUCTION

No. 3FU Foster Fastermatic Platen, 1942
No. 12 Sundstrand Stub Lathe, 1942
10"x12" LoBlond Multi-Cut, Late
Lipe Carbo-Matic, 1942
Lipe Mechanical Carbo, 1942

LATHES, TURRET

No. 5-0 Acme Universal, 1943
No. 3R Gisholt Universal, 1943
No. 4R Libby Universal, 1942
No. 2G Morey Power to Turret, 1942
H-5 Libby Universal, 1940
No. 3 Gisholt Universal, 1942
No. 2 Warner & Swasey Simplified, 1941

MILLS, PRODUCTION

No. 2048 Cincinnati Vert. Hydrotel, 1938
No. 00 Cincinnati Vertical, 1943
No. 3A Sundstrand Copy Mill, 1942
Hall Planetary Form Mill, 1942

MISCELLANEOUS

2000 HP Midwest Dynamometer, 1942
75 H P Gardner-Denver Air Compressor, 1942

PRESSES

650 Ton Verson Double Action Eccentric Press, 1940

SHAPERS

24" American Universal, 1942
20" Smith & Mills, Heavy Duty, 1942

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1961 S. Meridian St. . . Indianapolis, Indiana

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USED

22" BARNES Drill, Motorized
1" WOODS Hand Turret Lathe, MD
#4M FAMCO Arbor Press, Floor Model
30" EXCELSIOR Shear, Foot Operated
#2 OHIO Tool & Cutter Grinder
20 KVA UNIVERSAL Spot Welder, Foot Operated
150 Amp. G. E. Arc Welder, Portable, AC-DC
14"x30" cc. PRATT & WHITNEY Lathe, Cone, Motorized
20"x32" cc. BLAISDELL Lathe, Cone Drive, Motorized
14" DEMCO Drill Press, Pedestal Type, Large Table
#6 WELLS Wire Straightener & Cut-Off Machine
⅝"-18" LANDIS Threadir, Geometric Head
5½" CLEVELAND Automatic Chucker, 4 spindle
#7 WATERBURY-FARRELL Double Acting Cam Press
⅛" MARSHALLTOWN Throatless Shear
#310 BAKER Press, Heavy Duty
8'x12 ga. DREIS & KRUMP Leaf Bending Brake
24"x24"x36" PRATT & WHITNEY Planer, Motorized
6" GLEASON Gear Finisher, Straight Bevel
50 Lb. SMITH Acetylene Generator, Portable

NEW

16-Ton JOHNSON OBI Punch Press, Fly Wheel Type
43-Ton JOHNSON OBI Punch Press, Fly Wheel Type
56-Ton JOHNSON OBI Punch Press, Fly Wheel Type
56-Ton JOHNSON OBI Punch Press, Back Geared Type
79-Ton JOHNSON OBI Punch Press, Back Geared Type
5'x12 ga. DREIS & KRUMP Univ. Box & Pan Brake
#10 R FRAY All-Angle Vertical Milling Machine
30 KVA REX Spot Welder, Press Type, Air Operated
#15 BUFFALO Drill Press, Floor Type, Oil Table
15-Ton WIANT Hydraulic Arbor Press
6x12 LEACH Surface Grinder
24" WESTERN Stroke Shaper, Heavy Duty
#18D BUFFALO Drill Press, Floor Type, Round Column

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TRI-STATE PRODUCTS COMPANY
2268 Albion St. Adams 5131 Toledo, Ohio

OUTSTANDING MACHINE TOOLS

AUTOMATIC SCREW MACHINES
GYROMATIC Model 40 15/8" 6 spindle Late.

BORING MILLS—Horizontal
FRANKLIN 4⅝" Bar; table type; M.D.
LANDIS #40, 4" Bar; floor type; M.D.
LANDIS #3S floor type; 3½" bar; M.D.
LUCAS #41; 3" Bar; table type; P.R.T.
NILES 8" bar floor type, motor drive
UNIVERSAL; 3" Bar; table type; precision. Late.

BORING MILLS—Vertical
BETTS 120" 2 heads P.R.T.; M.D.
BULLARD 8", 16" 6-spindle "A" Mult-au-matic
COLBURN 72", 2 heads PRT. M.D.
NILES 53"; motor drive (heavy)

BROACHES
CINCINNATI 1-30 Duplex Vert. Hydr.
COLONIAL V.G. 1-10-48; Vert. Hydr. late.

DRILLS—Radial
CARLTON 3'9" Plain. M.D. Late.
CINCINNATI BICKFORD 6'15" Univ.; M.D.
KITCHEN & WADE; 4' arm, 13" Col.

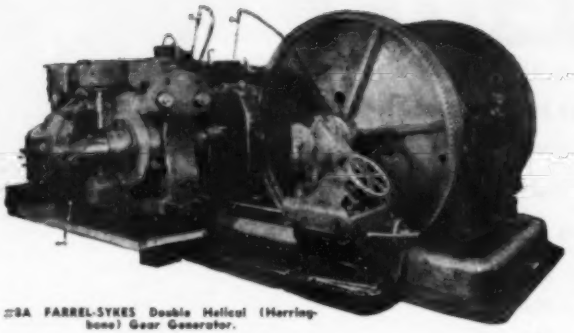
DRILLS—Miscellaneous
BARNES No. 420 Deep Hole; late
BARNES H-3 Hydram; hydr.; inverted; late
BARNES H-2 Hydram; hydr.; M.D.
BARNES 20" 4-spindle Camel Back. Late
BARNES 24" all geared; Camel Back; M.D.
BODINE #42-20 multi-univ., dial feed; M.D.
MOLINE 6-spindle Hole-Hog 2⅝"; M.D.
NATCO No. 14 Mult.; Rect. Hd.; PRT; M.D.

GEAR CUTTING EQUIPMENT
BILGRAM 6" & 16" Bevel Gear Cutter. M.D.
BROWN & SHARPE 6-72" Auto. Cutter; M.D.
CROSS #1, #40, #45 Tooth Rounders; M.D.
FARREL-SYKES 8A Herringbone Gear Generator, cap. 120", M.D.
FELLOWS No. 4 Enveloping Gear Gen., M.D.
FELLOWS Nos. 61A, 6Z2, 7S, 7, 7A, 72, 77 High Speed Gear Shapers; late
FELLOWS 13-LS Lapper; late
GLEASON #20 Tester
GLEASON 25" straight dbl. gear gen.; M.D.
GLEASON #13 Special bevel cutter-grdr. M.D.
GLEASON 18" hew. gear Tester & Lapper; M.D.
GLEASON #6 Revacycle. Late type.
GLEASON 3" & 12" Straight Bevel Gen.; late
GLEASON #4 & #6 Tester, Late Type
GLEASON 10", 11" & 18" Bevel Gear gen.
GLEASON 24", 27", 96" Bev. Gear Planer
GLEASON No. 14 Hypoid Grinder; late
MICHIGAN Gear Finisher, Model 862-24-A, 24" cap. Late.
PRATT & WHITNEY 10" Gear Grinder; late

GEAR HOBBERS
BARBER COLMAN #12 Motor Drive
GOULD & EBERHARDT #18H, Motor Drive.
GOULD & EBERHARDT #36 H; Late
GOULD & EBERHARDT #36HM 3 spindle Auto. Rougher; M.D.
KOEFFER WM-11 Auto.; bench type; Late
PFAUTER RS1; Max. dia. 30" late

GRINDERS—Plain Cyl. & Univ.
CINCINNATI 14x72 Model EM Plain, Late
LANDIS 16x36" Type C Plain, Hydr. Late type.
LANDIS 10x36" Type C Plain, Hydr. Late type.
LANDIS 6x18" Type C Plain; Hydr.; late
LANDIS 30" x 240" Plain cyl., M.D.

GRINDERS—Surface
ARTER 8" Rotary, M.D.
BILLITTER & KLUNZ 48"x196" Way Grinder



#8A FARREL-SYKES Double Helical (Herringbone) Gear Generator.

HEALD #22 Rotary, 12" chuck; m.d. Late
PRATT & WHITNEY 14x36" Model B, Late
TAFT PIERCE 6" Rotary, M.D.

GRINDERS—Misc.
BRYANT No. 8, 5, 16-C-16, 16-CF-16, 24 Intl. Hydr.; Late
EXCELLO #48 Carbide Late
GLEASON No. 12 Tool Sharpener; late
HEALD No. 72-A-5 "Gagematic" Int.; Late
HEALD No. 72-A-3 "Gagematic" Int.; Late
HEALD 72-A-3, 72-A-5 Plain; motor drive
HEALD No. 78 Internal Centerless; M.D.
LEMFCO 22x72" Mod. KG Crankshaft; Late
NORTON 10x72; type C; plain; M.D.
NORTON 10x120; plain; M.D.
VAN NORMAN 666 Crankshaft Regrind
VAN NORMAN 639 Osc. type Radius; Late

HEADS AND UPSETTERS
ACME 2" Model XN, late type
AJAX 3½" Upsetter, motor drive
MANVILLE #3 DSOD, Motor Drive, Reheader
MANVILLE #2 DSOD, Motor Drive, Reheader
WATERBURY FARREL #11, DSSD, Motor Drive, Reheader
MANVILLE #1A, DSSD, Motor Drive

LATHES—Engine & Mfg.
AMERICAN 36"x360" centers; 2 carriages
AMERICAN 36"x33" centers geared heavy
DENHAM 16x48", 12x54", 16x72" (gap), M.D.
JONES & LAMSON "FAY" 20x25" Auto. Late
LEHMANN 25x96" center; Timken; grd. M.D.
LeBLOND 16x36" center; Auto.; Timken; late
LeBLOND Mod. 7ACL Crankshaft; M.D.
LODGE & SHIPLEY 24"x96" centers; Late
LODGE & SHIPLEY No. 5—24" and 96" centers DUOMATIC Timken; Late
LoSWING 4x60", 8x24", 8x108"; late
MONARCH 18"x72" centers, Model "BDD" Hardened ways, geared head, Late
NILES 30"x46', 30"x50' Boring; "Time-Saver"; Timken; Late
SPRINGFIELD 14"x43", geared; M.D.
SUNDSTRAND 10x60" Auto. Late Type
SWIFT 16"x72" Centers, M.D. Late

LATHES—TURRET
MOREY No. 2 ram type TIMKEN
GISHOLT 1L, Saddle type, M.D.
MAGDENBERG Model MWF-BG-250 Univ. table type; P.R.T.; 12" hole through spindle; cross sliding turret; M.D.; Late

MILLING MACHINES—Pl. & Univ.
BROWN & SHARPE #2 Timken; M.D.
CINCINNATI #2 Plain, high power Timken; M.D.
CINCINNATI #4 Plain, high power Timken; M.D.
KEMPSMITH #2 Timken; M.D.
CINCINNATI 4-48, 4 spindle, Tracer; Late
ROCKFORD Rigid-Mill #3 M.D.
CINCINNATI No. 3; dial type; H.S.; Univ. late

MILLING MACHINES—Mfg.
GOULD & EBERHARDT 25 Cont. type; M.D.
INGERSOLL 32x24x16' Planer Type; 2 hds.
INGERSOLL 30x24x12' Adj. Rail Slab; M.D.
ROWBOTTOM Cam Miller
SUNDSTRAND Mod. 8A Duplex 42" feed M.D.
TAYLOR & FENN M-80 Duplex Spline; Late

MILLING MACHINES—Thread
HALL Style D Planetary, Late Type
LEES BRADNER HT 12"x84", M.D.; Late
LEES BRADNER HT 12x36" M.D.; Late
MOREY 12x30" centers; late
PRATT & WHITNEY 4½x12 Mod. C; late

PLANERS
BETTS CONSOLIDATED 84"x92"x16' 4 heads PRT Box Table; DC Reversing M.D.
BETTS CONSOLIDATED 108"x84"x44' 4 heads; PRT; Box Table; M.D.
CLEVELAND 48"x48"x12' Openside; AC; M.D.
GRAY 36"x36"x10', 4 heads PRT. Late.
NILES 108"x84"x42' 4 heads; Rapid Traverse; Box Table DC; M.D.
NILES-BEMENT-POND 72"x72"x30' 4 hds.; Rapid Traverse; M.D.
NILES-BEMENT-POND 60"x60"x12' Rapid Traverse, 3 swivel heads, box table, M.D.

SAWS
CAMPBELL #401 Abrasive cut-off. Late.
ESPEN LUCAS No. 670 30' cap Hydr.; Late
HELLER Model SS-1, 6¾ Cap Cold Saw

SHAPERS—SLOTTERS
DILL 18" Slotter; motor drive
PRATT & WHITNEY 6" Vertical; M.D.
PRATT & WHITNEY Mod. M 1251 10" Vertical
LYND FARQUHAR 26" Openside; M.D.
NEWTON 15" Slotter; M.D.
ROCKFORD 20" vertical, Hydr.; Late

PRESSES
BESCO Mod. 21 Incl. 40 ton, 3" stroke NEW
BIRDSBORO 325 ton Vert. Hydr; Late
BLISS No. 410A Toggle Drawing; tie rod; steel gearing
BLISS No. 3½A geared toggle; dble. acting
GLEASON 15" Quenching; hydr.; M.D.
HANNIFIN 6-ton, 16-ton; hydr. Late.
NATIONAL #H8 H.S. Maxi-Press (Forging)
SHORE, 500 ton Hydr. Flanging & Forcing Press
WATERBURY Farrel 125 Ton; St. Side

MISCELLANEOUS
BAKER #5 Keyseater; motor drive
BARNES No. 172, 214 Honing; hydr.; Late
CHAMBERSBURG 500 H.P. Billet Shear
CROSS #45 Tooth Gear Chamfering Machine
DeLAVAL No. 194 Coolant Clarifier; Late
FISCHER No. 1, Oil Groover; Late
GROB OS-20 Metal Band Saw—Filer; M.D.
HUGH SMITH 1"x24'6" Plate bending rolls M.D.
LANDIS 2" Dble. Spdle. Threaders; M.D.
LeBLOND #3 Barrel Lapper; M.D.; Late
MANVILLE No. 3 Trimmers; Late
MANVILLE No. 3C Thread Roller; M.D.
NIAGARA #116 Squaring Shear, Late.
QUICKWORK #5, ⅝" cap. #6 1" cap.
REED Thread Roller, Late
SAUNDERS 8-16" Pipe Machine; M.D.
ULTRA LAP #10 Lapper, M.D. Late.
US TOOL 810-B Cutter Reliever; Late
WATERBURY FARREL No. 11 Thread Roller

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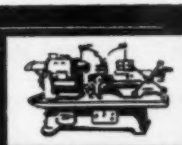

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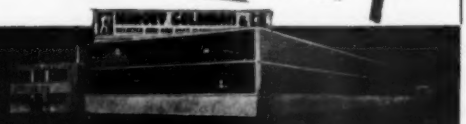
- AUTOMATICS
- BROACHES
- DRILLS
- GRINDERS
- LATHES
- MILLS
- PLANERS
- PRESSES
- SHAPERS
- MISCELLANEOUS

FOR IMMEDIATE DELIVERY

RECONDITIONED LATE TYPE
Model 601 W.D. Oster Turret Lathes
(Several)
For Bar and Chucking Work

A high speed, simplified machine capable of handling a wide variety of turret lathe work as efficiently as many more complicated and higher priced machines, and with less skilled operators.



HARVEY GOLDMAN & CO.
3900 SCHAEFER HIGHWAY • DEARBORN, MICHIGAN
TELEPHONE TIFFANY 6-4450
THE IDEAL POINT FOR PRODUCTION MACHINERY

IMMEDIATE DELIVERY

ROLLER LEVELLERS

McKAY ½" to 2" FOUR-HIGH LEVELLER 15" Diameter Rolls, (9) Leveling rolls, (11) backing up rolls, (2) Pinching rolls, (1) 300 HP motor for main drive, (2) 10 HP motors for screw down and (1) 2 HP motor for pinch roll adjustment.

McKAY ¼" TO 2" TWO-HIGH LEVELLER 13" Diameter Rolls, (11) Leveling rolls, (2) Pinching rolls, with 150 HP motor for main drive, (2) 7½ HP motors for screw down.

Above Machines Are New in 1943, Selling for 1/5 of Now Cost, Used Only 6 Months.

PUNCH PRESSES

1400 TON COMBINED CAPACITY, BLISS #2ET-10 TRIPLE ACTION TOGGLE 650 Ton, 39" stroke, 75" shut height of plunger, 400 Ton, 28" stroke, 72" shut height of blankholder, 350 Ton, 12" stroke of lower ram, 62" x 86" bed area.

525 TON, BLISS #410A DOUBLE ACTION TOGGLE 25" stroke, 62" shut height of plunger, 17" stroke, 60" shut height of blankholder, 60 x 84" bed area.

500 TON, BLISS #48 STRAIGHT SIDE FORGING 10" stroke, 38" shut height, 30 x 19" bed area.

385 TON COMBINED CAPACITY, #5S BLISS DOUBLE ACTION TOGGLE PRESS 25" stroke, 62" shut height of plunger, 17" stroke 60" shut height of blankholder 60 x 84 bed area.

255 TON, TOLEDO #96-D DOUBLE CRANK, STRAIGHT SIDE 6" stroke, 30" shut height, 51 x 87" bed area.

200 TON, VERSON #40ES ALL STEEL, LATE TYPE 30" stroke, 23" shut height, 35½" x 57¾" bed area.

150 TON, CLEVELAND #60-D-84 DOUBLE CRANK 12" stroke, 29" shut height, 46½" x 86" bed area.

Many Other Presses in Stock from 5 to 1400 Ton Capacity

PAUL'S MACHINERY CO.
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MUST MOVE PROMPTLY FROM LOCAL CUSTOMER'S PLANT

BEMENT MILES 18" SLOTTER with 3" dia. spindle. M.D.

GOULD & EBERHARD 36" Gear Cutter M.D.

BROWN & SHARPE #5—48" Gear Cutter, M.D.

BINSEE MACHINERY COMPANY HORIZONTAL BORING MILL. Table 30"x64". Quantity of boring bars.

CINCINNATI 60"x48"x14' Planer. 4 heads. 1 extra side head on massive floor stand for open side work. M.D.

B & O #2 Turret Lathe 1" Cap. M.D.

FOOTE-BURT #25—24" Heavy duty Vert. Drill #5 M.T. Motorized.

GRINDERS—CYLINDRICAL. B & S #11. 7"x 32". Plain Grinder. Table swivels. Motorized with 4 motors.

LANDIS 10"x36" Plain, M.D. Also Planer type Grinder 16"x36".

"BEMENT" 26" STROKE TRAVERSING HEAD SHAPER. 48" travel to ram. 2 tables (PLANER SHAPER)

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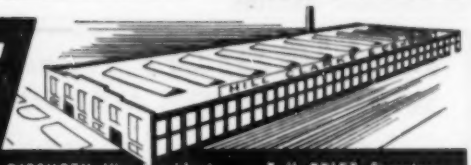

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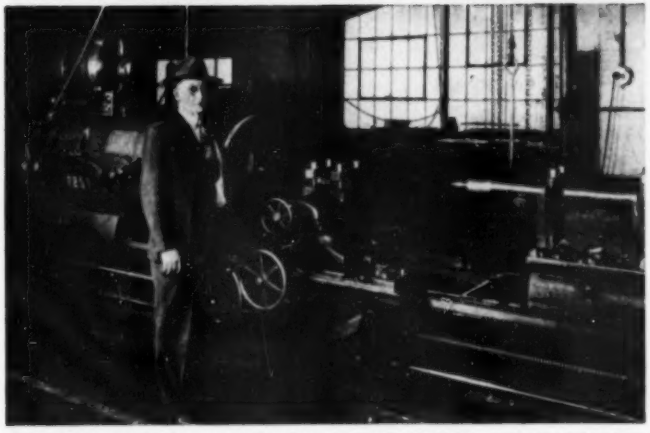


CUSTOMERS CONFIRM — YOU'RE ALWAYS SURE WHEN IT IS HILL-CLARKE: Economy—Quality of workmanship are reason THE BAUER BROS. COMPANY, machinery manufacturers, Springfield, Ohio, look first to HILL-CLARKE for dependable used machine tools. Above, SUPT. EDWARD A. ULLIMAN stands beside a 36" Lodge and Shipley Lathe purchased from Hill-Clarke.

AUTOMATICS

⅞" G Model Gridley
1-1/16" Model A Cleveland (1942)
1½" Foote Burt (1941)

DRILLS

1 Spdl—15" Sw—No. 2 Avey, Cam Fd.
1 Spdl—24" Sw—No. 2 MA6 Avey.
2 Spdl—24" Sw—No. 2 Aveymatic
4 Spdl—24" Sw—No. 3 MA6 Avey.
6 Spdl—14" Sw—No. 2 LMS L.G. Hyd.
21" Sw Defiance—No. 4 Taper
D-31 Fox Multiple Drill, No. 2 Taper.

GEAR MACHINES

No. 12-H Gould & Eberhardt Hobber
No. 12HS Gould & Eberhardt Hobber.
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper
No. 36-BM G & E 3 Spdl. Rougher
No. 65 Fellows—Cone Dr.

BORING MACHINES

Rockford—3¼" Bar
72" Niles—Hvy. Pattern

GRINDERS

6"x18" Norton Cylindrical (1943)
10"x36" Norton Cylindrical (1943).
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x50" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
16"x120" centers
16"-40" gap x 120" centers
18"x96" centers
18"-30" Gap x 96" centers
20"x96" centers
24"-32" Gap x 144" centers
No. A-3—12" Arter Rotary Surf.
No. 25-A Heald Surface Grinder
5A Bryant Internal
5B Bryant Internal
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 81 Heald Int. Cen.-Sizematic
No. 74 Heald Internal Centerless
No. 44 Excello Carbide Tool Gdr.

LATHES

14"x6' Walcott Lathe
12"x8' LeBlond Hvy. Duty Lathe
20"x9' Chard Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4 Warner & Swasey Tur.-Bar Fd.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.

MILLING MACHINES

No. 08 Cincinnati Vert.
No. 3 Sundstrand Rigidmil
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)

MISCELLANEOUS

24" Milwaukee Shaper
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
No. 0 Bakewell Tapper
No. 200 Micro. Horiz. Hone, 1 Spdl.
No. H-2 Micro. Horiz. Hone, 2 Spdl.
Model 200—H5 Micro.—Horiz.—2 Spdl.
14' Niles-Bement-Pond Roll
No. 6 R & K Straight-side Press, M.D.
42"-16 Ga. Economy Shear, M.D.
4-B Marvel Hack Saw
No. 5 Reynolds Power Screw Driver
75 Ton Hannifin Hyd. 4 post press
No. 175 G. T. Schmidt Marking Mach.
200 Ton Verson Hyd. Press

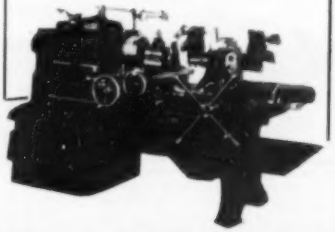
PLANERS

36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 Hds.
42"x42"x10' Cincinnati 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati; 2 hds.
48"x48"x12' Gray Maxi-Service
48"x60"x27' American, 4 hds.

Attention!

OF SPECIAL INTEREST

2 inch Bar Capacity
Swing 20¼ inches
No. 5W Cincinnati Acme Turret Lathe



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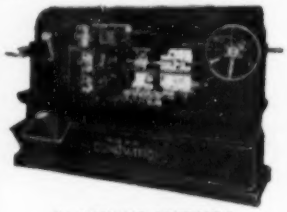
WIGGLESWORTH MACHINE TOOLS

AUTOMATICS

1½" Model F Gridley, 4 spdle.
1⅛" Greenlee 6 spdle., late
8½" Conomatic, 5 spindle
1½" Billings & Spencer Dimatic Cutoff



2" 4 SPINDLE CONEMATIC

GRINDERS

#25A Heald rotary surface, 30"
4 x 12" 4H Landis cylindrical
#2 Cinn. Centerless, plain
Model FG Micro Internal, Late
14x36" Norton C semi-auto., cyl.
73 Heald Internal Centerless
73 Heald Internal, 1944, like new
#300 Hanchett surface, 14x60"
#76RA Rogers knife grinder, 76"
P & W deep hole drill grinder, late
Oliver single point tool
Model 1311 P & W contour, late
#106 Rivett Internal
5 HP Marschke, single end

DRILLS

#3 Footburt 6 spdle. #3 M.T.
#24 Footburt, 3 spdle., #5 M.T., 24"
#2 Allen, 2, 4, 6 spdle., #2 M.T.
16" Syndor single, #5 M.T.
#2 Detroit Semi-automatic, horiz.
Type 14 Natco 12 spindle
#2 Bausch 24 spdle., #2 M.T.
D6 Colburn, single spindle, #5 M.T.
Model 4230 Bodine Drill & Tapper, 12 sta.
Moline Hole Hog, 2 spindle, older

GEAR MACHINERY

#13LS Fellows lapper
672 B & S cutter
7A Fellows, shaper, high speed, hvy dty
61A Fellows, shaper, high speed precision

LATHES & TURRETS

14x36" Lodge & Shipley, 3 step cone
#1A W&S Univ., serial 260313
#2 Simmons Microspeed
#4 W&S, serial 327317
36"x17" ctrs. Bridgeport, g.h.
Hepburn Shell
Model LaSwing 8 x 108" centers, g. h.
Gisholt Simplimatic, platen type

SHAPERS & PLANERS

10"x30"x17" Cleve. Openside
20" G & E shaper, v ram
48x48"x14' Deitrick & Harvey dble. hsg.
26" Smith & Mills shaper, 4 step cone

MILLS

#1M Cinn. vertical, late
#4 Cinn. High Power vertical
#11½B Milwaukee vertical
#3 B & S vertical
#3 Sundstrand Rigidmill, horiz.
#5 B & S plain horizontal
Briggs production, hydraulic
10C Van Norman Contour

FURNACES

Whiting Convertor, 2 ton cap., late
Model SP Jethe, gas, 1000° F
Lithdraw heat treat, 1200° F, late

PRESSES

#57 Toledo, 150 ton, s.s., s.c.
#1 Minster OBI, 12 ton, 2½" stroke
#2 Minster OBI, 16 ton, 3" stroke
#4 Toledo OBI, 25 ton, 2" stroke
#2½ Niagara OBI, 45 ton, 2½" stroke
#29 Bliss arch frame punch, 32 ton, 2" str.
General Flexible power arbor, 5 ton
100 ton Niles wheel press
No. 411 Bliss dble. crank toggle 600 ton

MISCELLANEOUS

STRAIGHTENER: #2 Kane & Roach, ⅛" tube
PUNCH: Southwark spin. end, 2" thru 1"
SPINNING RIVETER: Grant 5 spdle.
LAPPERS: 86-36" Gardner, vert. spdle.
BROACH: 10 ton Oilgear, model PED, late
HAMMER: 300# Bradley Upright Helve
BROACH: #4 Lapointe, horizontal
WELDERS: Hobart and P & H Arc, 400 amp.
BULLDOZER: #2 Ajax High Speed, 30 ton
SHEAR: #23 Niagara 3' 14 gauge, late

WE WOULD BE GLAD TO SEND YOU OUR MOST RECENT, COMPLETE STOCK LIST UPON REQUEST.

T. R. WIGGLESWORTH MACHINERY COMPANY
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DESIRABLE MACHINE TOOLS

AUTOMATICS

No. 00 B & S Automatics (12)
No. 0 B & S High Speed Automatics (3)
No. 0 B & S Automatics (5)
No. 0G B & S High Speed Automatics (3)
No. 0G B & S Automatics
No. 2 & 2G B & S Automatics
No. 13 B & S Automatics (4)
9/16" DAS Davenport Automatic
1¾" Cleveland "A" Automatics, late (2)
1-1/16" Cleveland "A" Automatic, late
1" Greenlee 4 Spindle Automatic
8½"x8" Goss & deLeeuw Chucker
No. 454 New Britain 4 Spindle Chucker

TURRET LATHES

24" Bullard New Era Vertical
No. 4A W & S Universal, serial No. 309,000
No. 3A W & S Universal
No. 2G Morey, late (3)
No. 2 Simmons, Bar, late
No. 4 W & S GH and GFH Universals

MISCELLANEOUS

No. 2 Norton Universal T & C Grinder
6" Jones Vertical Shaper, late
6"x18" Norton Type C Grinder, late
No. 1A Milwaukee Mill
24" Cincinnati Duplex 6 Simplex
No. 4 Cincinnati Vertical High Power Mill
No. 5 Cincinnati Plain Horizontal High Power Mill
12"x30" Handey GH Lathe, late
25"x15' Ryerson-Conradson GH Lathe
12"x54" American GH Lathe #56295
3" Gleason Bevel Gear Generator, late
No. 3 & No. 12 Barber Colman Gear Hobbers (7)
Reynolds Automatic Screw Driver
16" Buffalo Motor Spindle Drill, late
6' Cincinnati Bickford Radial Drill
No. 354 Niagara Power Slip Roll, late
No. 2 Cincinnati Centerless Grinders (2)
M5 Reynolds Auto. Screw Driver
50 Ton Henry & Wright Dieing Press

AGENTS FOR NEW CINCINNATI LATHES AND ROYAL DRILL PRESSES

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MacDell Availables in Late Type Guaranteed Machine Tools

Southwark 20' x 1" Plate Bending Roll. Drop End Type.

National 4" High Duty Forging Machine.

NATCO E5 Multi-drill Tapper 14 Sp. 1 MT 1941.

Cleveland 2½ Model A Single Spindle Automatic Mfg. 1943.

Pratt & Whitney 10" Gear Grinders Two Heads Mfg. 1941

Fellows 61A Gear Shapers Mfg. 1940.

Norton 23 x 72 High Swing Plain Cylindrical Grinder Mfg. 1943.

Heald 25A 24" Rotary Surface Grinder Mfg. 1941.

Ohio Model P Production Mill 36" Table Travel Mfg. 1943.

No. 3 Plan-O-Mill Form and Thread Milling Machine Mfg. 1945.

H 1 Micromatic Hone 1943.

MacDell Corp.
1042 W. Lake St. Chicago 7, Ill.

No. 3A High Speed Hammer, H.D.
Hardinge Model MD37 Lathe, ½" cap.
Laidlaw 30" Metal Cutting Band Saw.
No. 202-½ V & O Shell Trimmer.

D. E. DONY MACHINERY CO.
47 Laureiton Rd., Rochester 9, N. Y.

MACHINERY FOR SALE
ATTENTION EXPORTERS!

Unusual opportunity to procure modern Fellows Gear Shapers 61SA and 66S as well as 12" Gleason Generators, 36 BM Gould & Eberhardt Rougher, 87 Fellows Gear Shaper, #16 D. E. Whiton Machine. Write for full information.

FS-1053, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

1941-1952 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

CAM MILLERS

VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: #2 Face Mill Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang
ARCHDALE: Radials (New)
PRATT & WHITNEY: ⅛B x 50 Deep Hole Reaming Machine

GEAR CUTTING MACHINES

BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¼ D. P. capacity
CLEVELAND: Model 140 Rigidhobber, 1943 (like new)
CLEVELAND: Model 130 Rigidhobber, 1943 (like new)
FELLOWS: #4 Enveloping Gear Cutter
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x 24" Hydr. Spur Gears and Splines
GLEASON: #18 Spiral, Zerol & Hypoid, capacity 24" P.D.

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 4 and No. 6 Bevel Gear Testers, Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts

Grinders—Cylindrical—Cont.

LANDIS: 6x18" External
LIDKOPING: Centerless (New)
NORTON: 10"x36" plain, hydraulic
NORTON: 10"x18" 45° angle wheel

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
GLEASON: #18 Spiral, Zerol & Hypoid, capacity 24" P.D.
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL

BRYANT: No. 5Y Internal
BRYANT: 16C16 Hole, Hydraulic
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #639, capacity 7"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—SURFACE

AKTEK: A-1—8" Rotary
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18"

HONING MACHINES

BARNES: No. 306H Vertical, 24"
MICROMATIC: H-510 Double End Horizontal, ⅜" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia.

LAPPING MACHINES

FELLOWS: 8LSI and 13 LSI Gear Lappers, external and internal spur and helical
NORTON: No. 26 Hyprolaps, for flat work & cylindrical lapping
NORTON: 2Fx40" dia., for flat work

LATHES—PRODUCTION

DIMCO: Geared Head 12" to 66" swing (New)
AMES: 1" Bench, with attachments (New)
BLOUNT: Polishing speed lathe 12" dia. x 48" centers
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
PROGRESS: Geared head 16" to 30" swing (New)
ERNAULT: Toolroom lathes, 11 to 20" swing (New)
ERNAULT: High production hydraulic duplicating and copying lathes (New)

LATHES—TURRET

HERBERT: Turret Lathes, all sizes (New)
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)
MOREY: #2G

MILLING MACHINES

CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables of 36" dia.
DIMCO: #2 and 3 Univ. (New)
DIMCO: #3 Vertical (New)
RICE-BARTON: Duplex Spline
SUNDSTRAND: No. 0 Rigidmil
TAYLOR-FENN: M-80 Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

PRESSES

HPM: 1500 ton Hydraulic Briquetting Press, 24x48 platen (1943)
GEN. FLEX: Screw Press, 3 ton

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" & 9½" dia. cut-off saws, auto stock feed, hydraulic (New)
WILLIAMS: 10' Pipe & Tube Cut-Off

SHAPERS

HERCULES: 16" & 22" Shapers (New)
DIMCO: 16 to 33" Shapers (New)
KLOPP: 16" to 26½" Shapers (New)

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: 40A Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

MISCELLANEOUS

CUT-OFF: Campbell, abrasive 425 Cutalator 4½" dia. Capacity
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Pipe & Tube, 10" Williams
PRESS: HPM 1500 ton Briquetting
PRESS: Screw, Gen. Flex. 3 ton
RIVETER: Gen. Engr. 24" throat
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
PUNCH SHAPER: Sentinel Shrewbury, Thiel type design (New)
SHAPERS: Klopp 16 to 26½" (New)
SHAPERS: Hercules 22" (New)
SHAPERS: Dimco 16 to 33" (New)
GRINDER: WICKMAN Optical Profile Form Grinder (New)

INSPECTION INVITED — Telephone HAnover 2-4520

TRIPLEX MACHINE TOOL CORP.

75A West Street, New York 6, New York **Cable Address TRIMACTOOL**

MACHINE TOOL ENGINEERS SINCE 1919

HEADLINERS

MILLING MACHINES

No. 2 Kempsmith Universal, Turner Drive, vert. hd., slotting attach.
No. 3 Kempsmith Universal, Lima Drive
No. 2B Heavy Brown & Sharpe Plain
No. 3A Brown & Sharpe Universal
No. 4 Cincinnati High Power Universal
No. 4B Heavy Brown & Sharpe Plain
48" Cincinnati Plain Automatic

LATHES

36"x96" centers Boye & Emmes, cone
30"x174" centers Hamilton, Lima Drive
24"x60" ctrs American Hvy. Pat. 12-speed Grd. Hd., taper
21"x136" ctrs LeBlond Hvy. Dty., Turner Drive, taper
20"x94" ctrs American Grd. Hd.
16"x30" ctrs Lodge & Shipley Selec. Grd. Hd.
14"x30" ctrs Lodge & Shipley Selec. Grd. Hd.
No. 608-PV Rivett Precision Toolmakers

PLANERS

42"x42"x14' Niles-Bement-Pond Hvy. Pat., box table, 4 heads
48"x48"x12' Niles-Bement-Pond, 4 heads
60"x60"x32' G.A. Gray, 4 heads, excellent

TURRET LATHES AND AUTOMATICS

1⅛" Conc 4-spindle Automatic, bar feed
3"x36" Jones & Lamson "Hartness" Turret, bar feed, lots tooling, clean
Gass & DeLeeuw 4-spindle Automatic

GRINDERS

20"x144" Landis Plain Self-cont., arr. m.d.
10"x24" Landis Plain Self-cont., m.d.
10"x24" Norton Plain, m.d.
6"x32" Norton Plain, m.d.
No. 10 Brown & Sharpe Plain, m.d.
No. 49—53" Bosly Vert. Spdle. Surface, m.d.
No. 5A Bryant Hydraulic Internal, late
12"x28" Landis Universal & Tool, late
No. 2 Norton Motor Driven Universal Tool & Cutter
No. 48A Ex-Cell-O Carbide Tool, late

GEAR MACHINERY

No. 1 Adams Hobber, arr. m.d.
No. 2 Barber-Colman Hobber, m.d.
No. 5A Cincinnati 60"x16" Cutter
No. 12 Barber-Colman Hobber, m.d.
No. 4 Cincinnati Cutter, m.d.
No. 18HM Gould & Eberhardt Double Spindle Hobber, s.p.d.
18" Gleason Str. Tooth Bevel Gear Generator, s.p.d.
18" Gleason Bevel Gear Tester
No. 7 Fellows High Speed Shaper, m.d.
No. 61 Fellows Gear Shaper, m.d.
12" Gleason Bevel Gear Planer, cone

PUNCH PRESSES

No. 18 Bliss O.B.I., m.d.
No. 2 VKV O.B.I.
No. A3 Robinson O.B.I., arr. m.d. 32-tons
No. A4 Robinson O.B.I., m.d., 56-tons
No. 77 Toledo Open Back, b.d.
No. 2DT CANCO Deep Thrt. Horning m.d.
No. 5H Cleveland Horning, arr. m.d.

MISCELLANEOUS

10" Drill Slotter, m.d.
20", 24", 28" Gould & Eberhardt Shapers
No. 14½ W&W Punch & Shear
Class F Bertsch Punch & Shear
18" Niles-Bement-Pond Slotter, cone
200 lb. Bradley Compact Hammer, b.d.
2½"-6" Cox Pipe Machine, m.d.
1½" Landis 2-spdl. Bolt Thrd., m.d.
2½" Landis Long Bed Stay Bolt Threader, cone, leadscrew

Send us your inquiries.

COX MACHINERY COMPANY, INC.

3 MINUTES FROM THE CINCINNATI HOTEL DISTRICT

P. O. BOX 1953 CINCINNATI 1; OHIO
Office&Warehouse 311-313 Bakewell St.,Covington,Ky.

SPECIAL OFFERING!

LE BLOND RAPID PRODUCTION LATHES

13"-17"-20" Swing — All Late — Used Very Little — Below Ceiling

OTHER REALLY FINE LATE MODEL MACHINES

LATHES

30" Bullard V.T.L. new 1943
Boye & Emmes 18"x90" Heavy Duty

GRINDERS

Norton Type C HYD 8"x18" Cylindrical
Heald #81 Int. Centerless

MILLERS

Cinc. 00 Vertical Mill
Thread Mill. Hanson Whitney 4x8

SHAPER

Rockford 16" Hydraulic

DRILLS

Fondiek #6—2 Spindle—15" Overhang. Like new (3)
Leland-Gifford 2LMS Single Spindle
Leland-Gifford 1LMS Single Spindle (2)

TURRET LATHES

#1 W&S Elec. Head—Bar Feed
#2G Morey—Bar Feed
#4 W&S Ser. 329467
#2 B&O Chucker

PROFILER

Red Ring—2 Spindle—Like new.

WILLIAM HALPERN & CO.

245 CONNECTICUT AVE., BRIDGEPORT, CONN.
Tels.: Bridgeport 68-1249 or 3-9188

EXTRA LONG LENGTH HIGH SPEED DRILLS

IMMEDIATE DELIVERY!

No. By Gage	Length (inches)	Our Each Net Each
1-10	6¼	$1.00
11-20	5¼	.90
21-30	5¼	.80
31-40	5¼	.70
41-50	4½	.60
51-60	3½	.50

1/16" to 1/2" H.S. 12" long S.S. Drills; 17/32" to 31/32" H.S. 15" long T.S. Drills; 1" to 1¼" H.S. 20" long T.S. Drills also available.

VICTOR MACHINERY EXCHANGE, INC.

DEALERS IN TOOL ROOM EQUIPMENT
251-M Centre St., New York 13, N. Y.
Phone Canal 6-5575

Mill: No. 08 Cincinnati horiz. prod., Mfd. 1942

Wire Straightener: Shuster, cap. 3/16"x4'
Production Lathe: Seneca Falls "Lo-Swing" 8"x84"
Mill: Vertical, Hardinge, Mdl. BB2V, Mfd. 1943
Multiple Drill: C-12 Natco 12 spdls. No. 2 M.T.
No. 5 Mitts & Merrill Giant Keyseater
Shear: 10'x3/16" Loy & Nawrath
Lathe: 16"x10' South Bend 1940

BALL MACHINERY CO.
709 W. Lake Street Chicago 6, Ill.

OFFERED BY OWNER

ROCKFORD OPENSIDE PLANER

30" x 36" x 42"
Duplicator Attachment
1942 — Like New Condition

HILL MACHINE CO.
1041 W. State St. Rockford, Ill.
Phone 4-7831

SQUARING SHEAR

140" x 3/16" E. W. Bliss Motor Drive

WEST PENN MACHINERY COMPANY
1210 House Bldg. Pittsburgh, Pa.

TURRET LATHE

J. & L., 2¼" x 24", Serial #40,215. Priced right.

W. C. COWDEN MACHINERY CO.
Syracuse 4, N. Y.

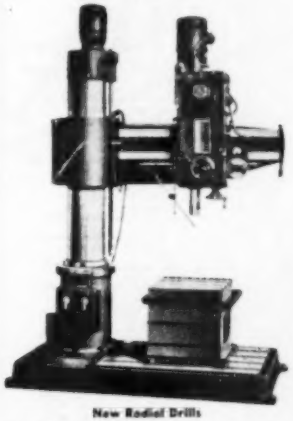
SOME LATE MACHINES STILL AVAILABLE

BORING MILLS

Cleveland 2½" Bar Cap.
Giddings & Lewis No. 0, 3" cap.
King 42", 72" Vert. 2 rail heads
Niles-Bement-Pond 4" 4½" Bar
Niles-Bement-Pond 60" Vert.

DRILLS AND RADIALS

Bausch Multi-spindle
American 6'x15" Univ.
Buffalo #2 Motor Spindle
Cincinnati Bickford 6'x15" cal.
Natco #12 20 spindle drill, Bausch
24" Sibley Sliding head
Foote-Burt #25 1" cap.
New Geared Box Cal. Drills



New Radial Drills

ENGRAVERS

Deckel type 3 Dim., New
Gorton #1A, ME, Deckel GIL
Gorton #3B 3 Dimensional

GEAR EQUIPMENT

Barber-Colman #2, #12 (3)
Fellows High Speed Shapers 712, 725, 71
Flather 72" Cutter
Fellows Red Liner
Gleason #4 Angular Bevel Tester
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter
National Broach Rod Ring Lapper, Shaver
Schuchardt & Shutte #1 Hobber
Fellows #20M Redliner

GRINDERS, MISCELLANEOUS

Bryant #5 Internal, chucking
Cincinnati 6x18" Cyl. Hyd.
Heald #73 Internal Centerless, Sizematic
Heald #81 Internal Gagomatic
Heald 72A3 Int. Centerless Sizematic
Landis 6"x30" Type C Cyl.
Majestic Internal

Norton Type C 6"x18" Semi-Automatic cyl.
Norton 6"x30", 10"x18" Type C cyl.
Norton 14"x96" cyl., 16x48 Univ.
Norton Roll Grinder 50"x28"
Oliver #510 Drill Pointer
Pratt & Whitney Radius #R6, K.O. Lee Tool
Sellers 6T Tool
Van Norman #666 Crankshaft
Wicaco Internal

GRINDERS, SURFACE

Abrasive 3B 8x24", #33 Vert. & #34
#10 Blanchard 16" Chuck, Portman
Blanchard #16, 36" Mag. Chuck
Heald 22—12" chuck, Arter 12"
Norton 6x18" Hyd., Coolant
Pratt & Whitney 12x36" Vert.
Reid 11x36 Motor in Base

LATHES

American 14"x30
Bridgeford 36"x20', 32"x16'
Lodge & Shipley #5 Duomatics
Hardinge Precision 9" 1" Collet Cap., Rivett
Hendey 12"x42" and 12x30", 1941
Hendey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed
Lipe-Carbo 12"x18" (2)
Putnam 42"x17', Sebastian 12"x4' G.H.
Wickes 32"x35' Geared Head
Reid Small Piece #9WSL
Sundstrand 8x15", 12" Stub
New 16, 18, 20", 28", Immediate Del.

New Lathes, Mills, Boring Mills, Broaches, Shears & Presses

MILLS, PLAIN, UNIV. PROD.

Archdale Plain, 14", Prod.
Brown & Sharpe #3B Plain Late, 3A, 2I
Brown & Sharpe 2L Univ. New
Cinn. 08 Plain, #2 Univ. Dial Type, New
Cinn. No. 3, 4 Plain Spd.
Hardinge Model BB4, Kent Owens 1V
Milwaukee #2B, Plain & Univ.
Simmons Micro-Mill #1A
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with Copying Attach

MILLS, VERTICAL

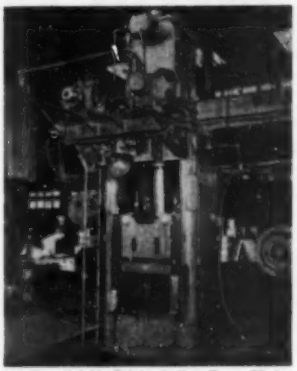
Brown & Sharpe #3 single pulley drive
Cincinnati #5, #4 hi-power
Cincinnati 08 Vertical
Moray #12M Profiler, 2 sp.
Pratt & Whitney Profiler 12B, 2 sp.

PRESSES

Bliss 645, 650 Hi-Production Presses
Bliss 18, 21, 215, OBI, 58, 62, 162, 08.
Bliss 41½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton, SS, Bliss 74½
Hamilton 850 Ton S.S. Bed 27x48
Bliss 5-48 Dbl. 32x48" bed, Cushion
Toledo 93½c Dbl. Crank 43x23" bed.
New 85, 60, 55, 30, 20, 15, 10, 5 Ton O.B.I.
Niagara Herning, 15 Ton
Niagara A1¾, O.B.I.
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Welsh No. 3 O.B.I. 23 Ton

TURRET LATHES

Acme 6W Fox 2-9/16" Cap. #2 Cross Slid. Turret
Brown & Sharpe, #2 Hand, #10, 11
Denver, 6 2" Shell Turret (2)
Foster #2B 2½" Cap.
Gisholt 1L, #5
Moray #2G Late
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1A, Timken Head
Warner & Swasey #1, 2, 3, 5 Late



150 Ton H.P.M. Triple Action Press 80 ton cushion, 50 ton blankholder, bed 36" x 36".

MISCELLANEOUS

Automatic, Cleveland Model B 1-1/16", 2½" A
Automatic B & S #00G, 0G
Automatic 4 Sp. 1½ Conomatic
Band Saw: DoAll Zephyr 36"
Bolt & Pipe Threader: Landis
Hacksaw: Peerless 6"x6"
Hacksaw: #6A Marvel 6x6 cap
Honer: Micromatic H-4
Keyseater: Davis, Baker, M & M
Oil Groover: with WICACO
Oster-Williams #915 Pipe & Nipple Threader 55
Shapers: 24" Rockford, 24", 28" Gould & Eberhardt. Cinn. 20, 24"
Broach: 3L LaPointe New Hydro. Horiz.
Shears Power: George Ohl 10' 3/16", 10' x 16 gauge, 11' 16 gauge
Welder: 50 KVA Taylor Air Operated, New Seam.
Welder: Taylor-Winfield 50 KVA Hi-Wave

HYDRAULIC EQUIPMENT

SELF CONTAINED PRESSES

1500 Ton Briquetting or Powder Metal Press, horiz. clamp cyl. 1000 tons.
125 Ton Southwark Press, Bed 96"x30". 30" stroke, 2 to 4 ft. opening
600 Ton William & White Up-moving Ram 42"x60" platen 12" str., 24" opening self-contained

MISCELLANEOUS PRESSES

300 Ton Watson Stillman 24x20" Platen 11" St. 21" opening

All Hydraulic Equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your Hydraulic problems.

NEW IN STOCK

Air Hydraulic Presses — Arbor Presses #6C Famco — Band Saws Kalamazoo — Famco 6x12"—Drill Presses all sizes—Hydraulic Press Northern 20 Ton — Injection Molders, 1 ounce — Power Presses, OBI, 1, 4, 4½, 5, 7½, 10, 15, 20, 30, 55, 85 ton—Shaper 7" Amco, 8" Shaperite — Shaper Sheldon 12" — Shears, Foot 22" to 8', 16 & 18 ga.—Shears, Power 3'x18 gauge to 10' x 10 ga.—Welders, Arc, Seam, Spot all sizes Motors, Grinders, Buffers, all sizes.

This is but a partial listing. Write for free Catalog. Inquiries Invited. HUNDREDS OF OTHERS

AARON MACHINERY CO., Inc., 45 Crosby Street, New York 12, N. Y.

"CABLE—AARMACH N. Y." **Telephone WOrth 4-8233**

UNUSUAL TOOLS

GEAR HOBBER

No. 72H Gould & Eberhardt universal. New in 1942 and used very little.

PRESS BRAKE

10'6"x½" Cincinnati type. New 1941.

KEYSEATER

No. 5 Mitts & Merrill 3"x18" cap'y, with motor and large lot of equipment.

BROACH

12 ton, 32" stroke No VU 12 Lapointe vertical hydraulic pull up, new 1948.

18 ton, 42" stroke, No. V42 American vertical hydraulic pull up, new 1936.

BROACH GRINDER

No. BG36-51 Colonial round broach grinder, serial No. M 11299, new in 1948.

DRILL

Two No. 7½-A-14 Baker two way hydraulic horizontal with 7½ HP motors. New 1946.

DRILL & TAPPER

Natco two way horizontal hydraulic, indexing fixture, total horsepower 17, new 1947.

GRINDER, INTERNAL

Three No. 24-36 Bryant, new 1941.

One No. 16-28 Bryant, new 1943.

GRINDER, DISC

30", No. 84A Gardner double end opposed disc with hoppe and disc feed, 25 HP spindle motors, new 1938.

GRINDER, SURFACE

12", No. 22 Heald rotary, serial No. 9874, new 1940.

GRINDER, THREAD

No. 33 Excello, new 1943. Now arranged for groove grinding.

HONING MACHINES

No. 172 Barnes, new 1942.

Two No. 2606 Barnes 2 spindle, index tables, new 1938 & 1939.

No. 2610 Barnes, new 1940.

MILLER, THREAD

8"x16" Hanson Whitney, new 1941.

No. CT36 Lees Bradner, new 1941.

MILLER, SPLINE

Two 4", Model M-80 Taylor & Fenn, new 1939 & 1942.

PRESS HYDRAULIC

1000 ton Baldwin Southwark, 42x54 bed, 20" stroke, 56" daylight. New 1940.

PRESS, DRAWING

650 ton No. 8411 Hamilton double action double crank toggle. Hydraulic clutch. New 1938.

MILES MACHINERY CO.
BOX 770 SAGINAW, MICH.

ONE SOURCE — ONE CALL

for any Machine Tool

WORCESTER 6-5175

VERTICAL BORING MILLS

Bullard 42" "New Era"—4-jaw chuck table, side head, 25 HP AC M.D.
Bullard 54" "New Era"—4-jaw chuck table, side head, AC M.D.
Betts 96"—table 98" dia., actual swing 106", 2 swivel heads, 69" under cross rail, M.D.
Cincinnati 10', Actual swing 125", 2 swivel heads, M.D.
Bullard #6A 6' Mult-au-matic, 6 spindles and chucks, M.D., late type.

FORGING EQUIPMENT

National 3" Upsetter, stroke of headers 12", die space 17½" x 20", work conveyor
Hilles & Jones #8 Guillotine Bar Shear, cap. 5" round, blades 18" long, M.D.
Milwaukee #200CL Hydraulic Briquetting Press, very late type.

GRINDERS

Cincinnati Model EA 6" x 30" Plain Hydraulic, Filmatic bearings, late type
Landis Model LC 14" x 72" Universal, misc. equipment, M.D.
Heald #70A, #72A1 and #72A5 Plain internal, misc. equipment, M.D.
Heald #22 and #25A Rotary Surface, magnetic chucks, M.D.
Greenly Type SGI Production Surface, 36" ring type chuck, M.D. very late type
Bridgeport 2HP Knife, travelling head type, auto. wheel feed, M.D. late type
Hanchett 10" x 36" Series GK Knife, cylindrical wheel, very late type

MISCELLANEOUS

Bliss #306 Straight Side Press, bed area 26" x 28", stroke 17½", cap. 135 tons, M.D.
National-Acme Model R-6 Automatic, 6 spindles, ⅝" cap., misc. tooling, M.D.

CAMPBELL #510 ROTARY BAR CUTTER, M.D., late model, never used.

Verson Model T-15-10 Press Brake, 300 ton cap., 10' x 1½" cap., M.D., late type.
Gardner & Oliver #5 Universal Turret Lathe, M.D., Late type.

This is only a partial listing of our huge stock of Machine Tools of every make and description.

Send for our free catalog "The Plant That Answers 1001 Machine Tool Problems".

Botwinik Brothers of Mass. Inc

3 SHERMAN ST., WORCESTER, MASS.

AUTOMATIC, 1⅝" 4 spin. Gridley Model G
BOLT THREADER, 1½" Williams Reliance
BOLT THREADER, 2" Landis, 2 Hds., M.D.
BORING MILL, 100" Cinci, Massive, 2 Hds., M.D.
BORING MILLS, 4½" bar Niles Duel Control; Tble. Type 3" bar Lucas & 3" Lambert
BORING MILL, 4½" bar Defiance, 2-6 Tble.
BORING MILL, 4" bar P & W, Floor Type
DRILL, RADIAL, 5 Niles #10 Rigidlies, Univ., Motor on arm
DRILL, RADIAL, 5' Amer., 14" col. Trip. Purp.
DRILL, RADIAL, 4' Wesfors, M.D. (2)
DRILL, RADIAL, 3½'/19" col. Foodick, Gear Box M.D.
DRILL, 24" Cinci, Bick., Tapping, M.D.
DRILL, No. 121 Baker, M.D.
DRILL, 16 Spin. Natco, C13-R
DRILL, MULTI 22 Spin. Natco #14, #3 M.T.
DRILLS, 21" Royersford Excelsior M.D. New
FACE GRINDER, 84" Bridgeport, 32" wheel
GEAR HOBBER, No. 36H Gould & Eberhardt
GEAR HOBBER, No. 12 Barber Colman
GEAR PLANER, 11" Rienecker Bevel
GEAR SHAPERS, Nos. 5, 04A, 04 & 01A
GEAR CUTTER, No. 13 B. & S. Spur & Bevel
GRINDER, DRILL, 3" capty. Oliver, M.D.
GRINDER, FACE, 84" Builders, 40 h.p.
GRINDER, 28"x120" Landis Cyl. Hyd. AC
GRINDER, 16VAB Bryant Int., 1943
GRINDER, Micro Internal, large capty.
GRINDER, SURFACE 14"x36" P. & W.
GRINDER, SURFACE, 30" Blanchard No. 16, M.D.
GRINDER, No. 4T Sellers Tool 1942
HAMMER, 1000 lb. Chambersburg Pneumatic, 1947
KEYSEATERS, No. 5 Baker capty. 4"x35" M.D.
No. 3 W. & M., capty. 3"x24" M.D.
LATHES, 42"x30' cen. Putnam Grd. Hd., M.D.
LATHES, 36"x22' cen. Bridgeford, 2 carr.
10" 32"x8' Harrington Gap, M.D.
12"x10' Hendey Grd. Hd., T.A. '42
24"/46"x15' bed Fay & Scott Gap M.D.
36"x20' cen. Putnam 2 carr. T.A. M.D.
32"x25' cen. Pitts Sommerfield, 2 carr., T.A. '42
30"x10' cen. LeBlond Cone T.A.
25"x12' Bed B. & E., T.A., Grd. Hd.
18"x10' bed L. & B., T.A. Cone Motorized
9"x10' bed L. & B., T.A., Grd. Hd., M.D.
18"x8' bed L. & S., Select Grd Hd., M.D.
TURRET LA, 21" Asme Universal Brass, late
20" Libby "C" 41½" capty.
No. 2B Foster Univ., 3½" capty., Bar Timken
No. 1B Foster Univ., 2" capty. M.D.
No. 601 Oster 1½" New
MILLER, No. 5-48 Cinci, Hydromatic Pl. M.D.
TABLES, RADIAL, 36"x20"x20"
THREAD MILLER, 12"x80" Morey Shields '42
MILLER, No. 4B, B. & B. Plain M.D.
MILLER, No. 6 Sundstrand Rigidmil, Hand
MILLER, No. 1½ B K & T Univ., Grd. Hd.
MILLER, No. 4A B. & S. Univ., Grd. Hd.
MILLER, No. 3 Cinci, Hi Power, Motorized
MILLER, No. 3 Cinci, Hor., Timken, #50 Taper
MILLER, VERTICAL, No. 4 Cinci., #50 Taper
MILLER, UNIV., No. 1 Cleveland, M.D.
PIPE THREADER, 2" Landis, Grd. Hd., M.D.
PRESS, 73½ Bliss S.S., 6" stroke
PRESS, No. 58 Toledo S.S., Gap, 171 ton capty.
PLANER, 96"x36"x14' Whitcomb, 2 Hds., M.D.
PLANER, 50"x36"x12' Woodward, 4 Hds., M.D.
PLANER, 24"x24"x5' Gray, M.D.
SAW, 8" capty. No. 6A Marvel, with feed
SHAPERS, 32", 20" & 16" B. & E. Gear M.D.

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20" HENDEY Heavy Duty Shapers (2)
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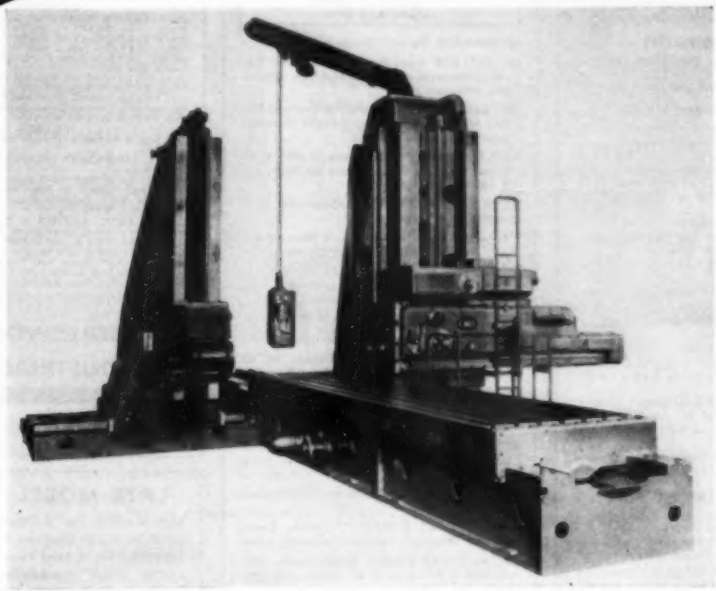

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Natco 2 AL and Natco 3 AL (Both Late)
Baker Multi-sp. Heavy Duty #60 HQ (Late)
Davis Thompson Multi-sp. Rotomatic (Late)

GEAR EQUIPMENT
Gleason 3-Sp. Straight Bevel Gear Rougher (Late)
Gleason 12" Straight Bevel Gear Gen'r (Late)

GRINDERS
Cincinnati #2 Centerless (—4—)
Bryant #5 Chucking Internal (Late)
Bryant #12 Internal (Late)
Heald 12" Rotary #22 Surface (Late)
Besly #205 Double End—18" Discs (Late)
Van Norman #666, 20" x 48" Crankshaft Re-Grinder (Late)
Arter 8" Rotary Surface (Late)
Jones & Lamson 8" x 48" Aut. Thread (Late)
Van Norman #673 Radius (Late)
Wilson Internal Grinder (Late)
Lobdell Roll 30" x 160"
Heald 72A Plain Extended Bridge

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Simmons #2 Turret (Late)
Gisholt 3 L and Gisholt 3 AL
Denver 6 2 Shell
Seneca Falls Model U Lo-Swing Shell 5" x 24" (Late)
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Boye & Emmes Cone Head 36" x 8' B.C.
Betts-Bridgeford 36" x 12 B.C.
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Bridgeford Lathe 68" x 21'

MILLS
Smalley #27 MB General Thread Mill (Late)
Lees Bradner 40A Thread (Late)
Lees Bradner Thread Mill Model HT (Late)
Hall Planetary Model C Thread (Late)
DeVlieg #31 Production Mill

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Tocco 200 KW Single Sta. with starter (Late)
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No. 1L GISHOLT Turret Lathe, bar feed, chucks, new 1942

No. 2B FOSTER Geared Head Turret Lathe, rapid traverse, AC motors

No. 60 NEW BRITAIN AUTOMATIC, 1" capacity, 6 spindle, rebuilt, new 1942

42" BULLARD Vertical Turret Lathe

24" BULLARD New Era Type Vertical Turret Lathe, side head, motor drive, threading attachment

100" BERTRAM (Niles Patterns) Vertical Boring Mill, 2 heads on rail, rapid traverse, new 1932

No. 1 DOUGLAS Plain Horizontal Mill, table 8"x32", power feeds, motor in base, No. 40 taper, new 1942

No. 5 CINCINNATI Plain Horizontal Mill, rectangular overarm, MD

3 Spindle FOSDICK Drill, No. 2 Morse taper 12" overhang, 1 HP 3/60/220 motor on each spindle, new 1942

4' AMERICAN High Speed Sensitive Radial Drill, 9" column, AC motor on arm

No. 6 TOLEDO O.B.I. Press, 56 Tons

72AS Heald Sizomatic Internal Grinder

25A HEALD Rotary Surface Grinder, 24" diameter, magnetic chuck

36" OHIO Dreadnaught Shaper, AC—MD

36" ROCKFORD Hydraulic Openside Shaper Planer new 1940

36"x36"x10' G.A. GRAY Maxi-Service Planer, reversing motor drive, box table, rapid traverse

1½" LANDIS Bolt Threader, leadscrews, AC—MD

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36" BULLARD Vertical Turret Lathe
42" BULLARD Vertical Turret Lathe

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20" CINCINNATI BICKFORD "SUPER SERVICE" Upright Drill
32" CINCINNATI BICKFORD Upright Drill
3'9" CINCINNATI BICKFORD Radial, Gear Box
5' REED PRENTICE Radial
5'13" AMERICAN Triple Purpose Radial
E5 NATCO Multi. Spindle Drill—Hyd. table, 1942
No. 425 BAKER B.S. Heavy Duty Drill
No. 2MS LELAND GIFFORD 4-spindle Drill

GEAR EQUIPMENT
No. 64 FELLOWS Gear Shaper
No. 725A FELLOWS High Speed Gear Shaper
No. 12 FELLOWS Gear Shaver, 1943
No. 308M GOULD & EBERHARDT Gear Rougher

LATHES
10"x61½" Cat. 187-R SOUTH BEND Quick Change Gear Lathe
13"x10" MONARCH "Air Gage Transv" Mono-Matic Lathe
14"x8' bed HENDEY Mod. ECM, N.O. Eng. Lathe
14"x8' STAR Engine Lathe
16"x8' bed FLATHER Double Back Geared Cone Drive Engine Lathe
16"x30" REED PRENTICE Sliding Gear Head Engine Lathe
20"x48" AMERICAN "PACEMAKER" Lathe
20"x10' LODGE & SHIPLEY Selective Geared Head Lathe
20"x144" LeBLOND Geared Head Lathe

GRINDERS
6"x18" LANDIS Type C Plain Grinder
8"x18" CINCINNATI Pl. Saddle Type Grinder
8"x18" CINCINNATI Pl. Saddle Type Grinder
10"x72" LANDIS Type C Hyd. Plain Grinder, '42
10"x96" LANDIS Type B Pl. Cylindrical Grinder with Gap Bed
#104 RIVETT Internal External Grinder
10/20 BRYANT Hyd. Internal Grinder
#73 HEALD Internal Centerless Grinders
TG-105 J&L Internal Thread Grinder
#55 HEALD Cylinder Grinder

MILLERS
No. 3-24 CINCINNATI Plain Hydromatic Milling Machine
No. 0-8 CINCINNATI (Model OT) Vertical Milling Machine
4½"x36" P&W Model C Thread Miller
No. 6 CINCINNATI Hi Power Vert. Milling Mach.
No. 2204 K&T Simplex Heavy Duty Bed Type Production Miller

AUTO. LATHES & TURRETS
No. 4D POTTER & JOHNSTON Auto. Tur. Lathe
No. 5DE POTTER & JOHNSTON Auto. Tur. Lathe
No. 6S POTTER & JOHNSTON Auto. Tur. Lathe
No. 1H5 LIBBY Heavy Duty Turret Lathe
No. 1L GISHOLT Saddle Type Turret Lathe, 1930
No. 2 B&S Wire Feed Hand Screw Machine

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LATHE: 12"x33" Fay Automatic
LATHE: 155mm Stammets Shell
MILL: No. 5-48 Cincinnati Prod.
MILL: No. 2 Brown & Sharpe Vertical
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120"x120"x30' N-B-Pond, 4 heads, DC, MD
BORING MILLS—16' Niles & 12' SELLERS, 1945
PLAIN GRINDER—20x210" Landis
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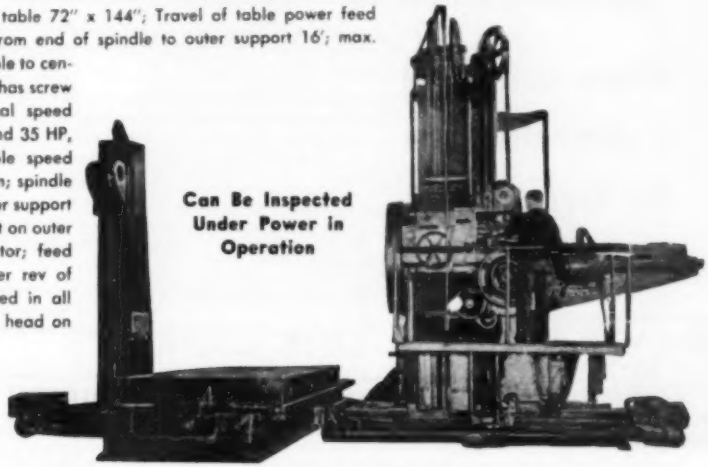

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LATHES

22"x72" Lehman Heavy Duty Engine Lathe, Taper Attachment, New 1941
1L Gisholt Saddle Type Turret Lathe, Cross Sliding Turret, New 1942
4—#1FU Foster Fastermatics, automatic Turret Lathe, Completely equipped, Air Chuck, Air Cylinder, Turret Tools, Hydr. Cross Facing Attachment, New, 1941

GRINDERS

72A Heald Universal Internal Grinder, New 1944
49—Heald Double End Boramatic 1943
47—A Heald Single End Hydraulic Cross Sliding Table, 1943
10"x36" Cinn. Hydraulic Cylindrical Grinder, New 1942
6"x18" Norton Vertical Surface Grinder, New 1942
6"x30" Cincinnati Cylindrical Hydraulic Grinder, New 1940
#24L-36 Bryant Internal Grinder, New 1940
#24-26 Bryant Internal Grinder, New 1940
25"x72" Landis Type C Hydraulic Cylindrical Grinder

MILLING MACHINES

4—Cincinnati Hi Power Plane Mill
5—Cincinnati Hi Power Plane Mill
Cincinnati 08 Vertical Mill, with Rotary Table, New 1944
33-48 Sundstrand Duplex Mill, New 1940

SHAPERS

#7125A Fellows Gear Shaper, New 1943
#61 Fellows Gear Shaper, New 1943
#72 Fellows Gear Shaper, New 1945
24" Gould & Eberhardt Industrial Shaper, New 1943

PRESSES

Colonial Vertical Press, 10-ton Capacity, 12" Stroke, New 1946

DRILLS

2—Barnes Horizontal Way-Type Drills, New 1942
Kingsberry Opposed Type Horizontal Drill, #18 Heads, New 1943
Bausch Radial Drill & Tapper, New 1942

GEAR MACHINES

140 Cleveland Rigid Hobbing Machine, New 1944
3" Gleason Straight Bevel Gear Generator, New 1942
2—3" Gleason Spiral Gear Generator, New 1942

HONING MACHINES

249 Barnes Honing Machine with universal table, new 1940
172 Barnes Honing Machine, New 1944

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BORING MILLS

42" Bullard New Era Vertical Turret Lathe

GEAR MACHINES

#36BM Multiple Spindle Gould & Eberhardt Bevel & Spur Gear Cutter—1940
10" Pratt & Whitney Two-Wheel Hydraulic Gear Grinder—1943
84"x30" Gould & Eberhardt Gear Hobber
#5GG-19 Gear Grinding Machine Co. External Gear Involute and Straight Spline Grinder—1942
#GG-31 Gear Grinding Machine Co. Internal Gear & Spline Grinder—1944
#61A Fellows Gear Shaper
#64 Fellows Gear Shaper—1942

GRINDERS CYLINDRICAL

6"x18" Landis Type C Plain Plunge Cut
6"x30" Norton Plain Hydraulic Infeed Reciprocating spindle
10"x18" Norton Plain Hydraulic
10"x36" Cincinnati Plain
18"x120" Norton Type A
#30A Brown & Sharpe—Plunge Cut
24"x216" Centers Landis Model B Plain

GRINDERS—INTERNAL

#72A5 Heald Plain—Extension Bridge—1943
#81 Heald Sizematic—1936
#81 Heald Gagematic—1936
#81 Heald Plain Chuck Type—1941

GRINDERS—MISCELLANEOUS

12"x36" Cincinnati Universal—1940
12"x36" Norton Type L Universal—1941
TG615 Jones & Lamson Automatic Thread Grinder—1941
#24—53" Gardner Horizontal Disc Grinder

HEADERS

250F Manville DSSD
#3 Manville DSSD
#1 Waterbury Farrel DSOD
#00 Waterbury Farrel DSOD
#2C Manville SSSD Bolt
#188C Manville SSSD Bolt
#5 Manville SSSD Bolt

LATHES

14"x30" Reed Prentice Sliding Gear Head—1939
14"x54" Lodge & Shipley—1941
13"x18" Monarch Mono-Matic
16"x48" Bradford Geared Head (3)—1940
26"x33" Swift Geared Head—1941
42"x40' Putnam Geared Head Quick Change
20"x54" Reed Prentice Sliding Gear Head—1939

MILLERS

24" Cincinnati Automatic Duplex (2)
Skoda Type FVSMZ Vertical—1942—Table Size 92" x 31½"
6"x36" Model LT Lees Bradner Thread Miller—1940
54"x18' Ingersoll Slab Miller

SCREW MACHINES

4¾" FOUR Spindle Cono-Matic—Bar Feed—1944
1⅜" #61 New Britain Six Spindle Automatic (2)—1939
#16A Gorton Swiss Type Automatic—1943
#438 Ceco Single Spindle—1942
⅜" Ceco Automatics (2) 1941—1942

TURRET LATHES

2L Gisholt—1938
#4 Gisholt—Universal—1939
#3A Warner & Swasey Universal
#4A Warner & Swasey Universal
#6W Cincinnati Acme Universal—1940

MISCELLANEOUS

#V-3 LaPointe Hydraulic Pull-Down Broach—1937

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Index of

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In This Issue

•

Abrasives, Coated 48, 86-87, 209, 226, 230, 249, 282, 314, 356

Accessories & Attachments (Machine Tool) 36, 57, 73, 74, 303, 348, 358, 361, 378, 384, 388, 393

Balancing Machines 36, 334, 382

Bearings ..... 4th Cover, 4-5, 88, 102-103, 252, 292, 336, 361, 366, 378

Bending Machines 376

Books, Technical 360

Boring, Drilling & Milling Machines (Horizontal) ..... 3rd Cover, 14-15, 20-21, 44-45, 77, 78, 101, 116, 389

Boring Machines Internal ..... 2nd Cover

Boring & Turning Machines (Vertical) ..... 3rd Cover, 14-15, 27, 110, 253, 368

Broaching Machines 265, 327, 341

Brushes 300

Cams 378, 388

Castings 272, 322, 325

Centering Machines 44-45, 308

Centrifugal Machines 290, 328, 391

Chucks 232, 235, 258, 313, 348, 352, 360, 364

Cleaning & Drying Machines & Supplies 312

Collets 57

Compressors, Air 365

Controls, Electrical 30-31, 266, 317

Coolant Systems, Filters & Supplies 225, 236, 261, 274, 305, 326, 340, 374, 386

Cut-Off Machines; Sawing Machines 69, 70-71, 72, 75, 100, 231, 294, 312, 371, 388, 418

Dressers, Grinding Wheel 290

Drilling Machines 18-19, 29, 49, 58-59, 64-65, 84, 109, 120, 124, 203, 215, 233, 323, 324, 334, 359, 362, 372, 375, 378, 381

Drill Jig Bushings 112, 391

Duplicators & Pantographs 98

Electro Plating & Polishing Equipment & Supplies 270, 363, 370

Fabricating Methods & Services 242-243, 274, 388

Fasteners 217, 302, 316, 333, 352, 358, 374, 380

Forgings 379

(Continued from page 412)

LET'S TALK FACTS ABOUT FACE MILLS!
"This NELCO solid-brazed, carbide tipped mill is the best tool we've got. We get the most for our money — it's solid, rugged and dependable . . . gives better finishes, higher table feeds and turns out more work between grinds. Boy! It's a Honey!"

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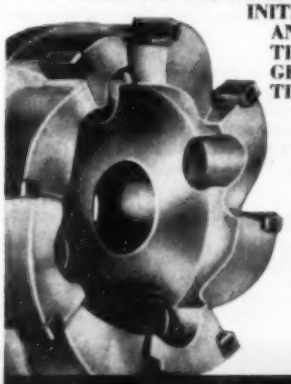

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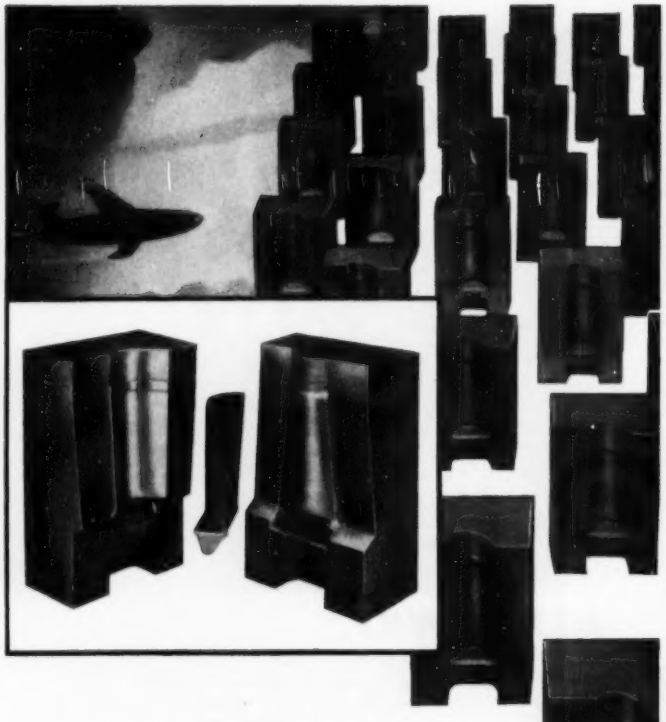

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MARKING DIE & MACHINERY DIV.
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Index of PRODUCTS ADVERTISED In This Issue

(*Continued from page* 411)

Gages & Instruments ... 16, 72, 80, 89, 181, 205, 238, 279, 288, 312, 342, 345, 353, 362, 370, 374, 393, 419

Gear Cutting Machines ... 3, 6-7, 105, 265

Gears, Speed Reducers, Motor Reducers ... 53, 235, 308 338, 339

Gear Testers ... 3, 6-7, 105

Grinders—Cutter & Tool ... 12-13, 104, 244, 341, 350

Grinding Machines—Production ... 4-5, 12-13, 39, 76, 112, 237, 238, 263, 271, 293, 308, 358, 387, 388, 392

Grinding Wheels ... 48, 86-87, 226, 249, 314

Heads: Drilling, Grinding & Tapping ... 10-11, 109, 334, 349, 362, 370, 378, 380, 391

Heat Treating Equipment & Supplies ... 26, 81, 286, 297, 326

Honing Machines ... 114, 276, 367

Hydraulic & Pneumatic Parts & Equipment ... 44-45, 60-61, 219, 231, 298, 337, 343, 344, 359, 383

Jig Bores ... 240, 283, 384, 388

Lapping Machines ... 369

Lathes, Automatic ... 22-23, 33, 34, 35, 36, 44-45

Lathes, Engine ... 46-47, 56, 62, 68, 98, 213, 306, 315, 323, 332, 351, 389, 413

Lathes, Turret ... 22-23, 33, 34-35, 36, 103, 323, 393

Lubricants, Cutting Fluids, Quenching Oils & Solvents ... 41, 54-55, 184, 186, 188, 255, 291, 299, 319, 417

Lubricating Systems & Equipment ... 305

Machines Nibbling ... 209

Machines, Super Finishing ... 36

Marking Machines & Tools 356, 388, 412

Materials, Cutting & Forming ... 182, 207, 254, 264, 289, 301, 331, 342, 357

Materials of Manufacture ... 42-43, 221, 223, 273, 275, 325, 329, 330, 347, 355, 377

Materials Handling Equipment ... 259, 267, 365

Mechanical Parts & Equipment ... 73, 74, 269, 303, 348, 384, 393

Index of

PRODUCTS ADVERTISED

In This Issue

•

Millers, Die Sinkers, Profilers 8-9, 281, 326, 354, 390
Motors, Electrical 30-31, 66-67, 79, 295, 318

Oil Purifiers 328, 391

Planers 14-15, 116, 309
Polishing & Buffing Machines 300
Power Transmission 53, 285, 320
Presses, Forging & Forming Equipment & Supplies 38, 90-91, 92-93, 211, 219, 240, 242-243, 253, 262, 277, 286, 304, 307, 312, 321, 335, 338, 346, 348, 352, 375, 378, 386, 388, 416
Production, Inventory & Tool Control 278
Pumps, Circulating 274, 344, 366

Riveting Machines 376
Rust Preventives 270, 284, 296, 310

Safety & Welfare Equipment 356, 420
Saw Blades 108, 245, 301
Screwdriving Machines 387
Screw Machines; Chucking Machines 3rd Cover, 17, 40, 69, 70-71, 72, 77, 78, 256
Shapers, Slotters, Keyseaters 82, 126, 281, 294, 360, 366
Shop Furniture 242, 243
Slitting Machines 350
Special Machine Tools 64-65, 381
Stampings 378
Steel Blue 352
Swaging Machines 228

Tapping Attachments 334, 378, 380
Tapping Machines 18-19, 22-23, 49, 64-65, 120, 334, 378
Thread Cutting Machines 10-11, 251, 304, 349, 384
Thread Rolling Machines & Tools 244, 251, 260
Tools, Cutting 24-25, 32, 37, 50-51, 52, 63, 73, 83, 85, 96-97, 99, 106, 118-119, 123, 227, 247, 248, 250, 257, 304, 311, 330, 338, 342, 352, 391, 411, 414, 416
Tools, Hand 229, 234, 287, 364, 373
Tools, Measuring 370, 415
Tools, Portable 58-59, 215, 293, 298, 337, 359
Turret Attachments, Lathe 57

Used & Surplus Equipment 394-410

Vibration Control 269, 330

Welding & Cutting, Brazing & Soldering Equipment & Supplies 268, 274, 280, 346

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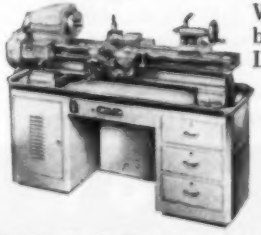

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INDEX TO ADVERTISERS

This index is published as a convenience to the readers. Every care is taken to make it accurate, but AMERICAN MACHINIST assumes no responsibility for errors or omissions.

	Page
Abrasive Machine Tool Co.	388
Abrasive Products Inc.	282
Acromark Co.	388
Air Reduction	231
Allegheny Ludlum Steel Corp.	377
Allen Mfg. Co.	333
Allis-Chalmers Mfg. Co.	79
Allison Co.	249
American Chain & Cable Co. Inc.	209
American Chemical Paint Co.	270
American Machinist	94-95
American Optical Co.	420
American Sip Corp.	385
American Steel Foundries King Machine Tool Div.	110
American Tool Works	29
Ames Co., B. C.	419
Ames Precision Machine Works	393
Anderson Oil Co., F. E.	188
Anglier Corp.	296
Apex Machine & Tool Co.	373
Armour & Co. Subsidiaries	230
Armstrong-Blum Mfg. Co.	28
Armstrong Bros. Tool Co.	74
Atlantic Gear Works Inc.	338
Atlas Press Co.	375
Avey Drilling Machine Co.	120
Baird Machine Co.	253
Ball & Roller Bearing Co.	378
Barber-Colman Co.	96-97
Bardons & Oliver Inc.	100
Barrett Co., Leon J.	391
Bath Co., Inc., John	227
Bay State Abrasive Products Co.	314
Bay State Tap & Die Co.	257
Behr-Manning Corp.	48
Belgian Electric Sales Corp.	318
Bellows Co.	383
Bethlehem Steel Co.	355
Bilgram Gear & Machine Co.	338
Black & Decker Mfg. Co.	215
Black & Webster Inc.	378
Black Diamond Saw & Machine Works Inc.	244
Blair Tool & Machine Corp.	378
Blake Co., Edward	350
Blanchard Machine Co.	76
Bliss Co., E. W.	90-91
Bonney Forge & Tool Works	229
Boyar-Schultz Corp.	387
Brown & Sharpe Mfg. Co.	69, 70-71, 72
Bryant Chucking Grinder Co.	237, 238
Bryant Machinery & Engineering Co.	56
Buffalo Forge Co.	372
Buhr Machine Tool Co.	381
Bullard Co.	77, 78
Bunting Brass & Bronze Co.	336
Butterfield Div. of Union Twist Drill Co.	37
Cadillac Stamp Co.	356
Campbell Div., Andrew C., Amer. Chain & Cable Co. Inc.	209
Canada Machinery Corp. Ltd.	332
Carboloy Co.	118-119
Carborundum Co.	86-87
Card Mfg. Co., S. W.	83
Carlyle Johnson Machine Co.	285
Carpenter Steel Co.	342
Carrier Corp.	340

INDEX TO ADVERTISERS

	Page
Central Safety Equipment Co.	356
Chambersburg Engineering	379
Champion Rivet Co.	352
Chandler Tool Co.	378
Chase Brass & Copper Co., Inc.	223
Chicago Pneumatic Tool Co.	327
Cincinnati Bickford Tool Co.	109
Cincinnati Gear Co.	338
Cincinnati Grinders Incorporated	4-5
Cincinnati Milling Products Div. Cincinnati Milling Machine Co.	41
Cincinnati Planer Co.	14-15
Cincinnati Shaper Co.	126
Clark Equipment Co. (Industrial Truck Div.)	259
Cleveland Twist Drill Co.	99
Columbia-Geneva Steel Div.	42-43
Columbia Tool Steel Co.	264
Columbus Die Tool & Machine Co.	388
Cone Automatic Machine Co.	17
Consolidated Machine Tool Corp.	27
Cosa Corporation	371
Crane Packing Co.	369
Crucible Steel Co. of America	207
Cuno Engineering Corporation	305
Curtis Pneumatic Machinery Co.	365
Davis & Thompson Co.	362
Davis Boring Tool Div. Giddings & Lewis Machine Tool Co.	85
Davis Keyseater Co.	366
Dayton Rogers Mfg. Co.	304
DeLaval Separator Co.	328
Delpark Industrial Filtration	225
Detrex Corp.	377
Detroit Broach Co.	123
Detroit Power Screwdriver Co.	387
DeVlieg Machine Co.	283
Disston & Sons Inc., Henry	357
Diversified Metal Products Co.	392
Dodge Mfg. Corp.	320
Dow Chemical Co.	273
DuPont de Nemours & Co., Inc., Electrochemicals Dept.	319
Dykem Co.	352
Eastern Machine Screw Corp.	370
Eisler Engineering Co. Inc.	388
Elastic Stop Nut Corp.	217
Ellstrom Standard Div. Dearborn Gage Co.	205
Erickson Tools	364
Ettco Tool Co.	334
Ex-Cell-O Corporation	112
Farquhar Co., A. B.	262
Federal Machine & Welder Co.	346
Federal Press Co.	335
Federal Products Corp.	279
Fellows Gear Shaper Co.	6-7
Felters Co.	269
Fenn Manufacturing Co.	321
Field, Herb M.	304
Firth Sterling Steel & Carbide Corp.	211
Fosdick Machine Tool Co.	84
Frantz Co. Inc., S. G.	326
Fray Machine Tool Co.	390
Fulmer Co., C. Allen	276
Gallmeyer & Livingston Co.	308
Gardner Machine Co.	39
Garrison Machine Works Inc.	235
General Electric Apparatus Dept.	66-67
Gerotor May Corp.	344
Giddings & Lewis Machine Tool Co.	14-15

(Continued on page 416)

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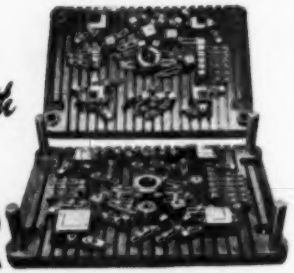

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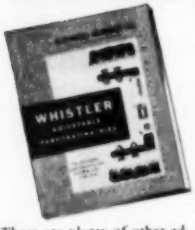

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INDEX TO ADVERTISERS

(Continued from page 415)

	Page
Gisholt Machine Co.	33, 34-35, 36
Gleason Works	3
Gorham Tool Co.	106
Goss & de Leeuw Machine Co.	256
Graham-Mintel Instrument Co.	342
Grant Gear Works	308
Grant Mfg. & Machine Co.	376
Gray Co., G. A.	116
Greenfield Tap & Die Corp.	247, 248
Griswold Mfg. Co., F. T.	345
Grob Brothers	388
Haas Miller Corp.	370
Hannifin Corp.	60-61
Hanson Van Winkle Munning Inc.	363
Hardinge Brothers, Inc.	57
Hartford Special Machinery Co.	244
H. E. B. Machine Tools, Inc.	68
Heald Machine Co.	2nd Cover
Heller Brothers Co.	287
Henry & Wright Div. Emhart Mfg.	92-93
Hill Acmed Co.	349
Hirschmann Co., Carl	361
Hisey Wolf Machine Co.	358
Holman Reamer Co.	352
Honan-Crane Corp.	261
Hones Inc. Charles A.	326
Houghton & Co., E. F.	255
Hyatt Bearing Div. Gen. Motors Corp.	88
Industrial Filtration Co.	225
Inter Continental Trading Corp.	370
Jacobs Mfg. Co.	313
Johnson Bronze Co.	292
Johnson Machine Co., Carlyle	285
Johnson Machine & Press Corp.	312
Johnson Mfg. Corp.	418
Jones & Lamson Machine Co.	89, 107
Jones & Laughlin Steel Corp.	289
Kalley Gear Works	338
Kearney & Trecker Corp.	20-21
Keller Tool Co.	359
Kelvin Systems Corp.	324
Kempsmith Machine Co.	326
Kennemetal Inc.	275
King Machine Tool Div. Amer. Steel Foundries	110
Kingsbury Machine Tool Corp.	18-19
Knight Machinery Co., W. B.	368
L-W Chuck Co.	352
L & J Press Corp.	286
Landis Machine Co.	10-11
Landis Tool Co.	12-13
LaPointe Machine Tool Co.	341
LaSalle Steel Co.	331
LeBlond Machine Tool Co., R. K.	46-47
Lees Bradner Co.	105
Lehmann Machine Co.	306
Leland-Gifford Co.	203
Lincoln Electric Co.	268
Lindberg Engineering Co.	297
Link-Belt Co.	52
Linley Brothers Co.	240
Littleford Bros. Inc.	274
Lodge & Shipley Co.	98
Logansport Machine Co.	348
Lovejoy Tool Co., Inc.	414
Lucas Machine Division, New Britain Machine Co.	101
Luers, J. Milton,	378
Lufkin Rule Co.	415

INDEX TO ADVERTISERS

	Page
Lyon Metal Products Inc.	242-243
Madison Mfg. Co.	342
Mall Tool Co.	298
Mallory & Co., Inc. P. R.	280
M.B.I. Export & Import Ltd.	351
McCaskey Register Co.	278
McGill Mfg. Co.	252
McGraw-Hill Book Co., Inc.	360
Mechanite Metal Corp.	322
Metal Carbides Corp.	391
Metal Goods Corp.	347
Meyers Co. Inc., W. F.	301
Micromatic Hone Corp.	114
Micro Switch Div.	266
Milford Rivet & Machine Co.	374
Millers Falls Company	245
Mitts & Merrill	360
Moline Tool Co.	378
Monarch Machine Tool Co.	62
Morey Machinery Co. Inc.	354, 393
Morris Machine Tool Co.	124
Morse Twist Drill & Machine Co.	24-25
Mueller Brass Co.	325
National Acme Co.	40
National Automatic Tool Co.	49
National Broach & Machine Co.	265
National Machine Tool Co.	294
National Malleable & Steel Castings Co.	272
National Tool Co.	52
National Twist Drill & Tool Co.	51
Nebel Machine Tool Co.	315
Nelco Tool Co.	411
New Britain Gridley Machine Co.	3rd Cover
Niagara Machine & Tool Works	75
Nicholson File Co.	234
Nicholson & Co., W. H.	298
Nilson Machine Co., A. H.	240
North Bros. Mfg. Co.	364
Nox-Rust Chemical Corp.	284
Oakite Products Inc.	312
Oilgear Co.	327
Oliver Instrument Co.	104
O'Neil-Irwin Mfg. Co.	294
Onsrud Machine Works Inc.	281
Orban Co. Inc., Kurt	82, 382
Osborn Mfg. Co.	300
Ottemiller Co., Wm. H.	380
Parker-Kalon Corp.	302
Parker Rust Proof Co.	310
Parker Stamp Works Inc.	412
Pawtucket Mfg. Co.	358
Pedrick Tool & Machine Co.	376
Philadelphia Gear Works	339
Plan-o-Mill Corp.	251
Procunier Safety Chuck Co.	380
Racine Tool & Machine Co.	366
Raymond Corporation	267
Ready Tool Co.	393
Reed Rolled Thread Die Co.	260
Republic Steel Corp.	329
Revere Copper & Brass Inc.	221
Rivett Lathe & Grinder Inc.	271
Rockford Machine Tool Co.	309
Rotor Tool Co.	293
Ruthman Machinery Co.	274
Ryerson & Sons Inc., Joseph T.	254
S.K.F. Industries Inc.	102-103

(Continued on page 418)

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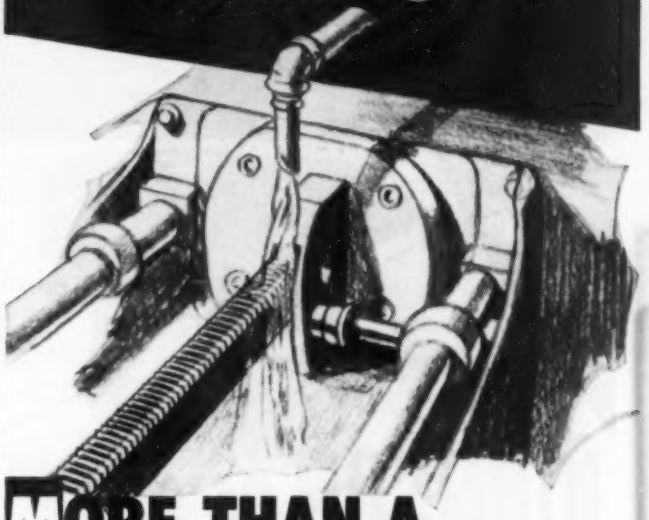

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INDEX TO ADVERTISERS

(Continued from page 417)

	Page
Scherr Co. Inc., George	312
Schnell Tool & Die Co.	338
Schrader's Son, A.	219
Scully-Jones & Co.	303
Shafer Bearing Corp.	366
Sheffield Corp.	181
Sheldon Machine Co.	413
Shore Instrument & Mfg. Co. Inc.	362
Sibley Machine & Foundry Corp.	233
Sidney Machine Tool Co.	213
Simonds Abrasive Co.	226
Simonds Saw & Steel Co.	301
Skilsaw Inc.	58-59
Skinner Chuck Co.	258
Smit & Sons Inc., J. K.	290
Snyder Tool & Engineering Co.	64-65
Socony Vacuum Oil Co. Inc.	291
South Bend Lathe Works	323
Springfield Machine Tool Co.	56
Square D Co.	317
Stahl Gear & Machine Co.	338
Standard Gage Co. Inc.	80
Standard Oil of California	184
Standard Oil Co. (Indiana)	54-55
Standard Pressed Steel Co.	316
Standard Tool Co.	32
Sterling Electric Motors Inc.	295
Stokvis Edera & Co. Inc.	389
Stuart Oil Co., D. A.	417
Sturtevant Co., P. A.	348
Sundstrand Machine Tool Co.	44-45
Sundstrand Magnetic Products Co.	386
Sunnen Products Co.	367
Sun Oil Co.	186
Super Tool Co.	311
Surface Combustion Corp.	286
Sutton Tool Co.	232
Syntron Company	384
Taco Heaters Inc.	236
Taylor Dynamoter & Machine Co.	334
Teiner Co. Inc., Roland	290
Tennessee Coal & Iron Div.	42-43
Thompson Grinder Co.	263
Thriftmaster Products Corp.	391
Tide Water Associated Oil Co.	299
Timken Roller Bearing Co.	4th Cover
Torrington Co.	228
Tubular Micrometer Co.	353
Union Twist Drill Co.	63
U. S. Products Inc.	356
United States Steel Co.	42-43
United States Steel Export Co.	42-43
United States Steel Supply Div.	42-43
Utica Drop Forge & Tool Corp.	307
V & O Press Co. Div. Emhart Mfg. Co.	352
Vanadium Alloys Steel Co.	182
Van Keuren Co.	16
Van Norman Co.	8-9
Vickers Inc.	343
Victor Saw Works Inc.	108
Viking Products Frostrode Div.	374
Walker Co. Inc., O. S.	360
Waltham Machine Works	384
Warner & Swasey Co.	22-23
Webber Gage Co.	288
Weldon Tool Co.	330
Wendt Sonis Company	250
Wesson Co. & Affiliates	73
Western Felt Co.	330

INDEX TO ADVERTISERS

	Page
Westinghouse Electric Corp. Electronic & X-Ray Div.	26
Westinghouse Electric Corp.	30-31, 81
Whistler & Sons, S. B.	416
Whiton Machine Co.	308
Wilson Co., K. R.	38
Wilson Mechanical Instrument Co.	374
Winter Brothers Co.	50
Wittek Manufacturing Co.	348
Wolverine Tool Co.	384
Yoder Co.	350
Zeh & Hahnemann Co.	386

SEARCHLIGHT SECTION
(Classified Advertising)

H. E. HILTY, Manager

EMPLOYMENT	Page
Positions Vacant	394-395
Position Wanted	394
Employment Agency	394
SPECIAL SERVICES	
Contract Work	394
General Pattern Works	394
Mode Co., P.	394
Sier-Bath Gear & Pump Co., Inc.	394
Standard Button Machine Co., Inc.	394
EQUIPMENT	
(Used or Surplus New) For Sale	394, 396-410

ADVERTISERS INDEX

Aaron Machinery Co.	405
Acme Machinery & Mfg. Co.	394
Adams Seed & Milling Co., The	394
Alexander & Fiden Machinery Co., Inc.	394
Ball Machinery Co.	404
Bennett Machinery Co.	406
Botwinik Bros. of Mass., Inc.	406
Botwinik Bros., Inc.	396
Brandt Machinery Co.	408
Brownell Machine Tools, Inc.	396
Chicago's Machinery Exchange	394
Columbia Manufacturing Co., The	394
Cowden Machinery Co., D. E.	404
Cox Machinery Co., Inc.	404
Currier Machine Sales	406
Dony Machinery Co., D. E.	402
Eastern Machinery Co.	398
Emerman Machinery Corp.	409
Falk Machinery Co.	397
Foster Machinery Sales Co.	408
Goldman & Co., Harvey	400
Halpern & Co., Wm.	404
Hill Machine Co.	404
Hill-Clarke Machinery Co.	401
Hyman & Sons, Joseph	396
Indianapolis Machinery & Supply Co.	398
International Merit Products Corp.	407
Johnson Machinery Co.	394, 396
Kings County Machinery Exchange	394
Lake Machinery Co.	402
Lockheed Aircraft Corp.	395
Lucas & Son, J. L.	410
M & N Machine Tool Works	394
MacDell Corp., The	402
Miles Machinery Co.	396, 406
Morey Machinery Co.	399
Moss Machinery Co.	408
Motch & Merryweather Machinery Co.	410
National Machinery Exchange	408
New Rochelle Tool Corp.	396
Noll Equipment Co.	408
O'Connell Machinery Co.	403
Osborne & Sexton Machinery Co.	400
Paul's Machinery Co.	400
Smith Machinery Sales, E.	406
Sunbeam Corporation	394
Tri-State Products Co.	398
Triplex Machine Tool Corp.	403
Victor Machinery Exchange	404
Wabash Employment Agency	394
West Penn Machinery Co.	404
Wigglesworth Industrial Corp.	408
Wigglesworth Machinery Co., T. R.	402
Winston Machinery Company, Inc.	396

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TIMKEN® bearings keep high speed boring mill accurate and free from vibration

THIS 52" King boring mill is especially designed for boring diesel locomotive wheels and facing the rims and hubs. Because carbide tooling is required, the table must rotate at high speeds. To insure smooth boring and facing, the King Machine Tool Division of American Steel Foundries mounts the table spindle on Timken® precision tapered roller bearings. They keep the table accurate, eliminate vibration.

Timken precision bearings are specifically designed for spindle applications. They have capacity for any tool loads because line contact between rollers and races provides load-carrying capacity to spare.

Because of tapered construction, Timken bearings take both radial and thrust loads. Spindles are held in rigid alignment and can be pre-loaded to any desired degree.

The King Machine Tool Division uses Timken bearings on the main drive shaft and in the constant speed and variable speed drives to hold shafts in accurate alignment and insure proper gear meshing.

No other bearing can give you all the advantages you get with Timken bearings. Make sure you have them in the machine tools you buy or build. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

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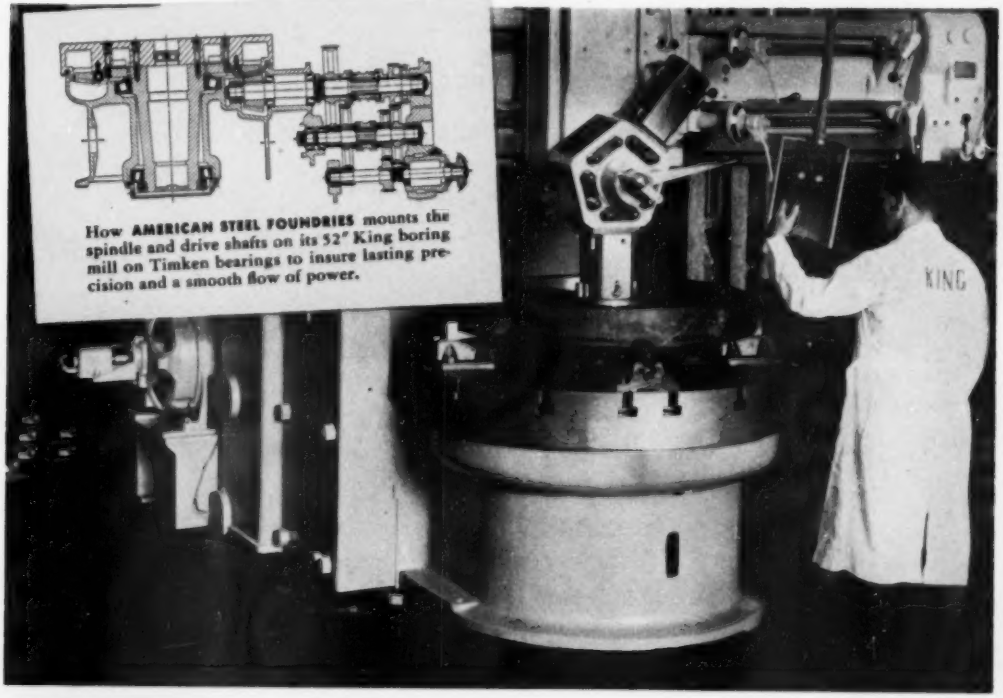

How **AMERICAN STEEL FOUNDRIES** mounts the spindle and drive shafts on its 52" King boring mill on Timken bearings to insure lasting precision and a smooth flow of power.

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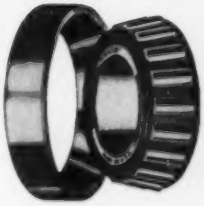

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◐ AND THRUST ⟷ LOADS OR ANY COMBINATION ✳